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AN EXPERIMENTAL STUDY OF THE RELATIONSHIP OF FILM MOVEMENT AND EMOTIONAL RESPONSE, AND ITS EFFECT ON LEARNING AND ATTITUDE FORMATION.

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THIS EXPERIMENTAL STUDY EXAMINED THE HYPOTHESES THAT FILM MOTION INCREASES AUDIENCE EMOTIONAL INVOLVEMENT, INCREASES POSITIVE ATTITUDE RESPONSE TO THE FILM AND DOES NOT AFFECT AUDIENCE INFORMATION RETENTION. OTHER HYPOTHESES WERE THAT THE GALVANIC SKIN RESPONSE (GSR) IS USEFUL FOR EVALUATING FILM AUDIENCE EMOTIONAL INVOLVEMENT, THAT AUDIENCE INVOLVEMENT RESPONSE IS POSITIVELY RELATED TO ATTITUDE RESPONSE, AND THAT NEITHER EMOTIONAL INVOLVEMENT NOR ATTITUDE RESPONSE IS SIGNIFICANTLY RELATED TO INFORMATION RETENTION. TREATMENTS WERE RANDOMLY ASSIGNED TO GROUPS OF FIVE SUBJECTS. THE 80 SUBJECTS WERE MOSTLY COLLEGE STUDENTS. THE VISUAL PORTION OF A 12-MINUTE FILM WAS USED FOR THE "MOVEMENT" TREATMENT. THE NON-MOVEMENT OR "FILMOGRAPH" TREATMENT REPLACED EACH SHOT IN THE ORIGINAL WITH A SINGLE FRAME SHOWN FOR THE DURATION OF THE SHOT. FACTUAL NARRATION WAS ADDED TO BOTH VERSIONS SO LEARNING COULD BE MEASURED. FACTOR ANALYZED SEMANTIC DIFFERENTIAL RATINGS WERE USED TO MEASURE ATTITUDES. TREATMENT GROUPS WERE COMPARED BY ANALYSIS OF VARIANCE. THE MOVEMENT GROUPS SCORED SIGNIFICANTLY HIGHER ON ATTITUDE EVALUATION OF THE FILM BUT NOT ON EMOTIONAL RESPONSE TO THE FILM AS MEASURED BY GSR. A RISE IN GSR RATINGS INDICATES GSR MAY BE A USEFUL MEASURE OF AUDIENCE RESPONSE. THE FINDING FROM EARLIER STUDIES OF NO SIGNIFICANT DIFFERENCE IN INFORMATIONAL LEARNING BETWEEN MOTION PICTURE AND FILM STRIP (FILMOGRAPH) WAS AGAIN SUPPORTED. (JT)

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An Experimental Study of the Relationship of Film Movement and Emotional Response, and Its Effect on Learning and Attitude Formation

by

William Charles Miller III

The word "Involvement" has been omitted in the title.

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
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AN EXPERIMENTAL STUDY OF THE RELATIONSHIP OF FILM MOVEMENT AND EMOTIONAL INVOLVEMENT RESPONSE, AND ITS EFFECT ON LEARNING AND ATTITUDE FORMATION

by

William Charles Miller III

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W.C.M.

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CHAPTER I

INTRODUCTION

The Problem

This study attempts to examine aspects of the motion pictures with results applicable to three major functions of the film: as an art form, as an instructional medium, and as a persuasive instrument. It is felt that properties unique or especially salient to the film can be examined with respect to these common film functions.

A brief macrocostic theoretical framework will furnish a background to the development of this study. Motion pictures are a communication form. This is obvious with the film designed to teach or to change an attitude or behavior. It may be less obvious to think of the art film as communication. However, modern aesthetic theory usually accepts the view of art as communication, although there is not always agreement about what it is that is communicated. (Abraham Kaplan, 1957, presents a modern view when he says that art communicates an expression--the expression of the significant.)

Communication implies the transmission of a message which is usually defined as a set of meaningful symbols--words, images, or other phenomena. Communication is generally a two-way process featuring feedback from receiver to sender. In the case of film and the film-maker, this feedback is often a circuitous and delayed process. Still it is assumed that the film-maker and those who use the film are very concerned about receiving some information feedback from the audience, even if that information is that the film was appreciated, that the information was learned, that an attitude was changed, or that the viewer had an artistic experience. (It is conceivable that there exist in isolation some artists producing highly personal works who do not care how people respond to them, or even if anyone responds. But this would seem to be unusual. Where it occurs it can be assumed that either the artist acts as his surrogate public or else that resulting personal creations become art only as they are so identified by someone.)

Communication requires a receiver, an audience. It is designed to produce an effect on that audience (Miller, 1966). This study is concerned with the effect of communication (a film) on an audience. Such research is well established with respect to film as a teaching instrument or as a persuasive device. But this audience-effects approach is also applicable to film as an art form.

Following an argument suggested by Abraham Kaplan, it can be said that an art object is that which produces an artistic experience in the viewer or listener. This experience can be analyzed as to type, intensity, and so forth. Similarly, the properties of the work which contribute to this experience can be examined. A detailed discussion of this is the province of aesthetics or the philosophy of art, but this approach indicates that analyzing the audience experience is suitable as a means of understanding the film as a work of art.

In particular, this study will examine a formal property of motion pictures, formal in the aesthetic sense of using form to refer to relationships of spatial and temporal elements in a work of art which produce audience response and hence enhance the quality and effectiveness of the work. In communication research, little attention has been paid to the question of form. Little has been done with the entire question of artistic communication. It is hoped this study will shed some light on this area, and on the relationship of a formal quality (in film) to attitude response and learning retention.

It has been repeatedly maintained by film theorists that the basic aesthetic unit of motion pictures is movement. It is felt that movement (and, related to movement, rhythm or tempo) is able, of itself, to affect the viewer's response. Generally, it is claimed that movement is capable of producing an involvement response in the spectator. It is the purpose of this study to investigate motion as a formal quality of film and its effect on the audience, specifically, to determine its effect in producing an emotional involvement response. Further, this study proposes to investigate the effect of the motion/emotional involvement response relationship on learning retention and attitude and attitude change.

In addition, this study proposes to investigate the use of the galvanic skin response (GSR) as a (film) communication research instrument, and to examine the interrelationships of attitude and attitude change, emotional involvement and learning retention.

Hypotheses

There are four major hypotheses to be investigated by this study.

1. Film motion as a salient formal property of films is capable, of itself, of creating audience emotional involvement response.
2. Film motion as a salient formal property of films is capable of creating a positive audience attitude response.
3. Film motion as a salient formal property of films is not a significant factor in audience information retention.
4. The galvanic skin response (GSR) is a useful instrument for evaluating film audience emotional involvement response.

Two additional subsidiary hypotheses are suggested by the above.

5. There is a significant positive relationship between film audience involvement response and attitude response.
6. There is no significant relationship between film audience emotional involvement and attitude

responses, and information retention.

Definitions and Symbols Used

The definitions given here cover terms and symbols used throughout the study. Additional specific terms will be defined within the body of the report.

Film motion.--A number of different types of movement are possible in motion pictures, for example, movement within the shot, movement from shot to shot, actual movement (as a person walking within the frame), relative movement (as the camera moving with reference to static objects), and apparent movement (as the seeming displacement of an object from one cut to another).[1] To attempt to control all such movement would be very difficult. For this study, film motion will be operationally defined as the camera and subject matter motion present in a motion picture as contrasted with a series of still pictures featuring the same subject matter.

Filmograph, freeze-frame.--The still version of a motion picture was prepared by making a filmograph of that film by a freeze-frame technique. A filmograph is a series of still pictures on motion picture film each printed repeatedly a predetermined number of times, so that the time each still picture appears in the film is controlled by the normal speed of projection. In making a filmograph from a motion picture, the freeze-frame technique is used, that is, a single frame from a particular scene is chosen to represent that scene, and then is printed repeatedly until it is of length equal to that of the original scene.

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[1] In actuality, all motion pictures are apparent movement since they consist of a series of still photographs.

Emotional involvement.--It is recognized by this investigator that "emotion" is an inexact term. The expression "emotional involvement" might be more accurately defined as level of activation, excitation, or arousal. In this study it will be limited to that level of activation, arousal or excitation as measured by the galvanic skin response.

GSR.--The galvanic skin response (GSR) is a measure of the level and change of resistance (conductance) of the skin to a small current passing through it. It is widely accepted that this provides a measure of level of activation or, more generally, of "emotion."

Attitude.--It is not the purpose of this study to debate a general definition of attitude, something which does not reflect unanimity on the part of behavioral scientists. Attitude has been defined as a set held as a prelude to action (McNemar, 1946), as a stand individuals hold about objects, issues or persons (Sherif, Sherif, and Nebergall, 1965), and as a generalized affective relation between the individual and a single object (Carter, 1965). Davis (1964) says it is an inferred factor within the individual involving the tendency to perceive and react in a particular way toward some aspect of his environment. Cohen (1964) resolves any problems by saying:

> This book does not take up the definition and conceptualization of attitude, but instead assumes that there is a commonly accepted core of meaning for the term "attitude change" which can serve as a working basis in the present review. (p. xi)

In this study attitude will be operationally defined as scores on Likert-type items asking the subject to express his feelings and views--his attitudes--relative to the film and its content, and as measured by the evaluative scales of the semantic differential.

Attitude change.--Attitude change will be defined as the difference between pre- and post- semantic differential scores taken on the evaluative scales. Such short term effects may not truly represent a significant attitude change, but in the absence of any delayed time testing, and for the purpose of comparing treatment groups, this definition is satisfactory for this study.

Learning retention, or information retention, or retention.--This measure of the amount the subject learned from the film is determined by a written test asking specific questions about material in the film. It has no long-term connotations, but refers to immediate retention of material.

Treatment types.

M	Motion picture version
F	Filmograph version

Treatment groups.

MM	That group which saw the motion picture version of both halves of the film.
FF	That group which saw the filmograph version of both halves of the film.
MF	That group which saw the first half of the film as a motion picture, the second half as a filmograph.

FM	That group which saw the first half of the film as a filmograph, the second half as a normal motion picture.

GSR units.

R	Resistance
C	Conductance
LC	Log Conductance

Statistical notation.

NS	Not significant

Other statistical notations are standard.

CHAPTER II

REVIEW OF THE LITERATURE

There is very little in the literature which is directly antecedent to this study. While there has been a great deal of experimental research on motion pictures, most of this is concerned with the ability of the film to teach, with some work on its persuasive ability. The primary emphasis of such studies is, understandably, to treat the film instrumentally. Rarely will one find a study which approaches the nature of film as it is discussed by film theorists and aestheticians. Many of the film theorists have been active film-makers. The works of some are film classics. Many of their theoretical ideas are exemplified in their films. Some of these ideas are supported by appeals to theories of perception, psychophysiology and psychology. But it is extremely rare for any of these theories to be empirically tested.

In one sense, this study tries to bridge the gap between film theorizing and laboratory testing of theory. In this it is rather a unique study, at least in the film area. It is in the tradition of experimental aesthetics, a legitimate area of psychological and artistic study not so prevalent today as it was a few decades ago. It is hoped that this area of study will be taken up by Communication--a relatively new field which draws on interests in many of the older disciplines and encompasses areas of behavioral science and aesthetics (as film, television and, often, theater).

This review of the literature will draw upon a number of areas to provide a theoretical and methodological background for this study. (Additional literature relating specifically to the GSR and its use will be discussed later when that instrument is considered.)

Theoretical Background: Film

Many film theorists advocate two points which are basic to this study: (1) that the basic aesthetic unit, the unique formal property, of the motion pictures is movement, (2) that film movement (especially as rhythm) can, of itself, produce emotional responses in the viewer. Some of their remarks shall be briefly noted.

Of all the formal aesthetic properties of film, motion (and rhythm, which can be considered controlled or cadenced motion) is most frequently cited as the basic artistic property of film. Rudolf Arnheim (1957) says, "Motion being one of its outstanding properties, the film is required by aesthetic law to use and interpret motion" (p. 181).

Paul Goodman (1960), in analyzing a definition of cinema, quotes B. G. Braver-Mann (from Experimental Cinema, February, 1930), "The medium of cinematic art is motion" (p. 230), and again, "Motion applied to a succession of images can transmit thought, stimulate emotion, indicate time, place, character, sound, speech, atmosphere, physical sensation, and state of mind" (p. 231). Kirk Bond (1960) similarly stresses cinema as "an art appealing to the eye through motion--motion, that is, conventionalized in a definite medium" (p. 211).

In his recent book, Film: A Montage of Theories (1966), McCann states in the Introduction that "the first essential of the motion picture is motion" (p. 17).

Joseph and Harry Feldman (1952) maintain that "without rhythm there would be no art of the film" (p. 197).

The Russian film-maker and theorist, V. I. Pudovkin

(1960), stresses the importance of rhythm (cadenced motion) as a means of influencing the spectator. He feels that through the rhythm of editing the emotion of the viewer may be affected. "This rhythm is the means of emotionally influencing the spectator. By this rhythm the director is equally in the position to excite or to calm the spectator" (p. 131). After describing how one might visualize a fight scene, Pudovkin says:

> From the above is clear the manner in which editing can even work upon the emotions. Imagine to yourself the excited observer of some rapidly developing scene. His agitated glance is thrown rapidly from one spot to another. If we imitate this glance with the camera we get a series of pictures, rapidly alternating pieces, creating a stirring scenario editing-construction. The reverse would be long pieces changing by mixes, conditioning a calm and slow editing construction (as one may shoot, for example, a herd of cattle wandering along a road, taken from the viewpoint of a pedestrian on the same road). (p. 70)

A little later, Pudovkin underscores his belief that editing may influence the viewer.

> One must learn to understand that editing is in actual fact a compulsory and deliberate guidance of the thoughts and associations of the spectator. If the editing be merely an uncontrolled combination of the various pieces, the spectator will understand (apprehend) nothing from it; but if it be co-ordinated according to a definitely selected course of events or conceptual line, either agitated or calm, it will either excite or soothe the spectator. (p. 73)

Sergei Eisenstein (1957), a contemporary of Pudovkin, carries these ideas even farther, pointing out the possibility of film form and structure creating physiological responses in the audience member. He feels that filmic rhythm can have a physiological effect on the spectator which in turn can create emotional response. For example, he describes that during a moving sequence in one of his films he observed the audience rocking from side to side in increasing tempo to match the increasing tempo of the film. Speaking of the combination of visual picture and sound in films, he says that "visual as well as aural overtones are a totally physiological sensation" (p. 70). And for this, he says we need a new vocabulary, not simply "I see" or "I hear" but "I feel" (p. 71). He speaks of metric montage, the absolute length of each shot forming a rhythmic beat, as something which can bring into unison the "pulsing" of the film and "pulsing" of the audience. Later, describing the structure of a sequence in his film *Alexander Nevsky*, he speaks of modeling this structure on the inner process of such an experience. As the knights in the film gallop pictorially, Eisenstein claims that compositionally this presents the "beat to the bursting point of an excited heart" (p. 152).

A modern writer on film, Ernest Lindgren (1963), writes that "the film is, above all, an art of movement" (p. 137). He expands on this by saying:

> What has the film-maker to correspond to the colour and visual design of the painter, the solid masses of the sculptor, the musical sounds of the composer, and the word sounds and stresses of the writer and poet? Undoubtedly the answer to this question is, movement. The film-maker has pictures, but they are moving pictures, and movement . . . is the most important element in their composition . . . filmic movement, that is to say, movement controlled and patterned by manipulation of the film medium. . . . (p. 92)

Another modern film theoretician, Siegfried Kracauer (1960), also discusses the importance of movement. He introduces a subject we shall discuss at further length, the fact that movement may provoke kinesthetic responses in the audience member. He writes:

> Movement is the alpha and omega of the medium. Now the sight of it seems to have a "resonance effect," provoking in the spectator such kinesthetic responses as muscular reflexes, motor impulses, or the like. In any case, objective movement acts as a physiological stimulus. . . . the effect itself appears to be well-established: representations of movement do cause a stir in deep bodily layers. It is our sense organs which are called into play. (p.158)

The most definitive film theorist on this subject is Slavko Vorkapich. He has published very little. Most of his ideas must be garnered from writings about him or his lectures. His forthcoming book should be well-received.

Vorkapich stresses the visual patterns of motion.

> I firmly believe that there is no scene in any picture which could not be made more effective, emotionally--more intense and artistically more lasting by imparting to it the proper rhythm and devising some significant motion which would best express the given mood. (1930, p. 33)

He feels that motion itself is capable of producing a response in the viewer. ". . . we may create pleasure and entertainment by suggested motions. By merely seeing motion on the screen our minds, conscious or subconscious, may be made to react in a similar manner as in active participation" (1930, p. 30). He goes so far as to make a brief catalog of the emotions and sensations suggested by different kinds of motion, much as some aestheticians have suggested that graphic lines of different direction and form possess different emotional values. Vorkapich also claims that we react bodily, kinesthetically, to any visual change, a greater visual change producing a greater response. For example, he says we will respond "kinesthetically" more strongly to a cut from a long shot to a close-up, than from a long shot to a medium shot (1959).

These ideas are stated in some detail in the record of a series of recent lectures by Vorkapich given at the Museum of Modern Art (Kevles, 1965). Vorkapich maintained that movement was the unique quality in which film differs from all other arts. He refers to the sense of movement as the kinesthetic sense. In a development of a theory closely related to that of empathy, Vorkapich states that a film, as a work of art, can consist of movement organized into "kinesthetic melodies and orchestrations." In response to this, the audience member experiences a kinesthetic esthetic response, or what Vorkapich terms "cine-esthetic." "If film will have form, it will be based on this kinesthetic activity. In the power of the film to arouse a wide range of muscular responses may be found the source of a new art form . . ." (p. 38). Vorkapich believes the film-maker can generate emotion through movement. (See also Swerdloff, 1950)

Theoretical Background: Aesthetics

Motion (or rhythm) as we consider it here is primarily a formal property of the film. For some understanding of the nature of form and of the way it might affect the observer, we turn to aesthetics and the psychological study of experimental aesthetics. First we shall consider these subjects as discussed by Abraham Kaplan (1957).

Form, as explained by Kaplan, is used in the sense of a relationship between the properties of the work of art, and the observer of this work. In a sense, it is a description of how such properties as shape, color, texture, movement, symbolism, and so forth--determinants of form--work on and give a structure to the viewer's experience. Through form, the art experience receives its unity and organization, as well as some of its emotional quality. Some of the "principles of form" named by Kaplan are the principles of unity in variety, of harmony, balance, rhythm, development, order and equilibrium. Without presenting a detailed formalistic theory of art, it will be sufficient to say that there are a number of properties of a work of art which may be considered predominantly formal, and these are those that offer a unique contribution to the art experience by helping to structure that experience, but are themselves little investigated or understood.

One distinguishing feature of an art experience is intensive involvement. German aesthetic philosophers centered on this involvement in discussing the role of empathy in the aesthetic experience. There is an empathic response to a work of art; it takes place through the body. The structure of the experience is maintained by certain bodily sets and activities. Muscular and glandular functions figure in the response to a work of art. (Consider the myths in our culture that emphasize the tremendous power of music as seen in the piper's flute or the magic fiddle which makes you dance. Orpheus plays and the stones move.) All art is rhythmic--a predominantly formal function. There is a bodily motor response to the elements of form in all art media. "You feel it in your body first, or you don't feel it at all," Professor Kaplan maintained. Most of these motor responses are unconscious; we are not aware of them, or else we experience them as an awareness of the work of art. This motor element in an empathic response is the biological base of aesthetic experience. Kaplan maintained that it is very likely that when one "looks" at sculpture, one may be experiencing it in one's hands or fingers.

However, the sum of empathic response is not included in muscular response to form. One empathizes with other aspects of the work of art besides merely its form. And Kaplan maintained there are more subtle operations at work than muscular ones. Subtle, expressive qualities experienced in ourselves are transmitted to the art experience. For example, it is said "the mountain rises and pushes against the sky." But it is not the mountain which does so, it is we who do; it is we who have "up" and "down" and not space which has them.[1]

Empathy has also been discussed by others. Albert Chandler (1934) feels that the expressiveness of music depends on its work through empathy, and that the forms of music thus have emotional significance. He also feels that lines--still or moving--owe their expressiveness to empathy.

> Inner imitation evokes appropriate moods within us. The competitive excitement of the hurdle race, the dreamy amorous delight of the waltzers, the tranquillity of the sleeping child. The tree writhing in the wind suggests agonized supplication, not because we mistake it for a human being--we do not--but because the muscular response in it is of a type that would express such a mood. The wavy lines of distant lowhills are as "tranquil" as the form of a sleeping child. . . . The object comes to us clothed with these meanings, because the perception of it is, from the first, interwoven with the imitation. (p. 49)

Chandler maintains it is our inner imitation which leads us to impute moods and emotions to visible objects. He further states that inner imitation "enables the artist to communicate his moods by displaying lines, masses, and objects which arouse empathy in the spectator" (p. 49).

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[1] Kaplan also claimed that tests taken of responses to motion pictures have shown that a most exciting scene is horses running, that this produces a marked bodily effect. This experimenter has not come across such a study, nor did a recent letter to Professor Kaplan produce the reference.

Lanz (1931) discusses rime as having

> the power to stimulate our emotions independently of the intellectual content of the verse. It achieves this object by introducing a new variety of rhythm; that is, its power to stimulate our emotions depends directly on its rhythmical power. (p. 195)

Hevner (1950) says that:

> In empathy we project our own states of being into inanimate objects, and attribute to them the activities which we ourselves are experiencing. The sensations of strain and movement from our own muscles and joints, induced directly by the stimulus, are not perceived as our own sensations, but are projected into the stimulus, and thus give it greater significance. Modern experiments have shown that actual movements can be detected during the process of perception. (p. 701)

Hevner goes on to point out that our motor and muscular activities are aroused by form. It is to the form of a work of art that we so respond.

To many experimental aestheticians, the reaction to form--a reaction which is part of the process of empathy--is a motor or physical reaction, that is, a kinesthetic reaction. Poffenberger and Barrows (1924) mention this in their discussion of the feeling value of lines. Mursell (1937), writing about music, calls the kinesthetic an essential resposnse to rhythm. This view receives some additional support from Boring (1942) and from Miner (1903) who also applies the idea to visual rhythms.

Schilder (1942) identifies kinesthetic and motor responses as valuable to the perception of color, motion, and space. Gibson (1950) also discusses the role of kinesthesis in perception.

The actual extent to which empathy or kinesthetic or motor responses function to produce an audience response is not the province of this study. That they should have some such function would seem established by the above discussion. Some have tried to relate a motor response/emotional response relationship to an extension of the James-Lange theory of emotion in which it was speculated that the emotion *was* the body set which characterized it. Such a view would say that by kinesthetically--empathically--inducing certain bodily responses in the audience member you thus create the emotion the stimulus attempts to induce. We may be skeptical of this view since the James-Lange theory is questionable (see Lindsley, 1951). However it is plausible that although the state of physiological arousal is not sufficient of itself to induce an emotion, combined with appropriate cognition, it may certainly reinforce or encourage the emotion. Schacter (1964) discusses "*déjà vu*," or "as if," emotions so produced, but also points out that given this state (induced by drugs in his studies) subjects will "label" it with what cognitions are available. This seems to support the idea that the motor- or kinesthetic-producing formal properties of an object (usually, though not exclusively, an art object) may reinforce or aid the emotional or mood response evoked by other qualities in the work, or at least make the viewer more attentively aroused toward giving an emotional response.

That there should be such a relationship is interesting, and a fine topic for future research. It is not the subject of this study, but only a theoretical background to support the use of motion as the independent variable in this study, and to indicate how there might be a relationship between motion and audience response, especially level of activation as measured on the GSR. We now turn to examine relevant experimental educational studies with film.

Educational Film Studies

Most of the empirical research with film has been in connection with its use in education--either in the public schools or in the armed forces. It is well-established that film can both teach information and affect attitudes. There are many valuable reports of studies in this regard, for example, Allen (1958), Instructional Film Reports

(1953, 1956), MacLennan and Reid (1964) and May and Lumsdaine (1958). Closely related research can be found in the vast amount of material on instructional television (such as Instructional Television Reports, 1956). One outstanding work is the definitive survey of educational film studies done by Hoban and van Ormer (1950). One aspect of their findings is especially applicable. A section of their survey is devoted to a discussion of audience involvement factors which affect film influence. They identify six such factors: identification, familiarity, subjective camera, anticipation, participation, and dramatic structure and cartoon form. Their discussion covers a wide variety of topics from the early Dysinger and Ruckmick (1933) GSR studies of commercial fiction films to instructional films on knot tying and the use of cartoon form. This very variety of material with its feeling of being somewhat haphazard probably reflects the paucity of studies in this area, but perhaps even more reflects the lack of a systematic approach to this question of audience involvement factors in films. Hoban and van Ormer feel there are more involvement factors to be identified and further experimental research needed. This writer feels there is also need for a planned approach to a basic understanding of the film and its effect on an audience. It is hoped this study might be a move in this direction.

Since this study by its design compares motion in film with non-motion, that is, a series of still pictures or a filmograph, there is one area of educational film studies which has some relevance. Studies comparing the effectiveness of the film with that of the filmograph or with filmstrips might furnish some evidence of an expected audience response in a certain direction. A review of these studies show this is not to be expected. Hoban and van Ormer (1950) review a number of these studies (i.e., McClusky, 1924; James, 1924; McClusky and McClusky, 1924; Brown, 1928; Carson, 1947; Vernon, 1946; Goodman, 1942; Hovland, Lumsdaine and Sheffield, 1949; and Gibson, 1947). The net result of all the studies indicate that findings on this issue are equivocal. Sometimes the film seems more effective a teaching instrument, at other times the filmograph or filmstrip does. There seem to be too many extraneous variables at work which are not identified in simple comparisons of films to filmstrips or filmographs. Most of the research, Hoban and van Ormer conclude, has not taken into account such possibly significant variables as rate of development and level of verbalization, to name just two.

They suggest the general conclusion that where studies show motion pictures to be superior it may be because movies are better able to portray interacting events; where filmstrips are found to be superior it may be due to the slower rate of development used in the actual filmstrip presentation to an audience.[2]

More recent studies such as those mentioned in Allen (1958), Instructional Film Research Reports (1954), and MacLennan and Reid (1964), indicate similar equivocal results.

A British study might be mentioned since one of its conclusions relates to this study. Field (1954) tested the reaction of children to children's films using infrared photographs taken at pre-selected points while the children viewed the films. Among her conclusions is the statement that "movement rather than static composition appears to satisfy the aesthetic tastes of the audience" (p. 22). While she is careful to note that the children's standard of beauty may not correspond to that of adults, her finding is interesting since it is different from that of usual film studies, and bears directly on what has been discussed under aesthetical considerations.

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[2] This is not true of a filmograph where the rate of development is fixed. However, it is probably true that for the filmograph any particular still picture offers the viewer more time to study the fixed visual images.

From studies comparing film with filmstrip and filmograph, it may be concluded that there is no empirical evidence for expecting, a priori, a difference between the treatment groups of this study with respect to learning retention and attitude change.[3] There is slight evidence for expecting greater interest (cf. the attitude measure of this study).

Some few film studies have examined the relationship between learning retention and attitude (or, since in this study attitude refers largely to attitude toward the film and material from the film, to the relationship between learning retention and interest or like-dislike of the film). From the limited evidence available, Hoban and van Ormer (1950) conclude that for adult audiences, "likes" and "dislikes" seem to be related to the influence of film on opinion. Likes and dislikes also seem related to students' judgment of the educational value of a film. Allen (1958) and Hoban and van Ormer point out that from the little data available there seems little correlation between interest in films and information learned from them (although Hoban and van Ormer add that at times, under certain unexplicable conditions, some correlation appears).

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[3] The justification for the hypothesis of this study that there will be a greater attitude score and attitude change from the motion treatment group rests primarily on theoretical considerations rather than empirical evidence.

Twyford (1953b) performed a study using a Film Analyzer, that is, an electrical response and recording instrument whereby subjects could depress a key to indicate, in this case and for different groups, if they felt they were learning, if they predicted their classmates were learning, or if they liked or disliked the film. Subjects were 276 high school and college students. The film used was one on precision measuring instruments. An objective test about material in the film was given all subjects subsequent to viewing. Results indicate that there was little relationship between a profile based on "like-dislike" and tested learning. There was a high positive correlation between the "I am learning" profile and the amount learned.

Therefore in this study there is no expectation of a relationship between attitude measures and information retention. By extension there is no expected relationship between audience emotional involvement and information retention.

Hoban and van Ormer (1950) briefly discuss physiological responses under the section on audience characteristics and the heading "Thresholds of Excitability." They only mention one study: Dysinger and Ruckmick (1933). It is their summary which is of most interest since it stresses the importance of investigation into these phenomena. They say:

> The relationship between excitement, involvement, and acceptance is not clear. Here is one of the major areas for film research. It is basic to the choice of dramatic or narrative technique in instructional films. (p. 7-12 [sic])

Related GSR Studies

While few studies using GSR and related psychophysiological methods have attempted the same approach as this study, there are a number which fall into related areas, such as studies in which film was used, or studies of attitude change or emotional response to music. These will be reviewed to show how the GSR has been used as an effective instrument to measure response to communication. Difficulties with some studies will be pointed out. (Specific terms related to GSR measurement will be discussed when that instrument is considered. A number of these terms which appear in this literature survey will be more fully discussed at that time.)

An early study was that of Dysinger and Ruckmick (1933). They noted wide individual variation of physiological response to motion pictures. They found children more responsive than adults, especially to scenes of danger and to love scenes (where adolescents were most responsive). They ran their experiments both in the laboratory and in a prepared theater. Most of their subjects were children. They reported different degrees of excitement for various ages, various dramatic contents, and the two sexes. The films they used were commercial films.

A number of studies using the anthropological film _Subincision_ have been reported by Lazarus, Speisman, and their associates (Lazarus, _et al_., 1962; Speisman, Osborn and Lazarus, 1961; Lazarus, Speisman and Mordkoff, 1963a; Speisman _et al_., 1964; Lazarus, 1964; Lazarus and Alfert, 1964; Lazarus _et al_., 1965). In the original study (Lazarus _et al_., 1962), the authors wanted to determine the value of using motion picture film to induce psychological stress, and to identify and interrelate response dimensions for evaluating film-induced threat, including some study of personality sources of reaction differences. Their experimental film was _Subincision_, an anthropological film depicting a ceremonial rite of a primitive tribe in which crude operations are performed with a piece of flint on the penis and scrotum of several adolescent boys. It is a silent film of 17 minutes length. The control film used was Corn Farming in Iowa, 11 minutes, and of relatively neutral arousal value, although hopefully mildly interesting. Personality variables were studied with the California Psychological Inventory (CPI) and the Minnesota Multiphasic Personality Inventory (MMPI), a version of the Schlesinger Picture-Sorting Test and the Stroop Color-Word Test. Two autonomic measures--heart rate and skin resistance--were recorded. Questionnaire rating forms and the Nowlis Adjective Checklist of Mood were also used. Subjects were 35 male and 35 female college students. A cluster analysis of skin resistance and heart rate measures was made. Results of the study showed that all three dimensions of response--autonomic reactivity, Nowlis Mood Checklist and interview questionnaire measures--reflected highly significant increases in response under the stressor condition as compared with the control. Of all measures of skin conductance, they found mean base level to be most sensitive in comparing group stimulation.

A later study (Speisman et al., 1964) created three soundtracks for use with Subincision, each designed to augment or decrease the sources of threat in the film. In addition to base level analysis, they also used _t_-tests to compare film versions at equivalent sampled points of the two films, arguing that tests done solely with mean base levels could mask significant results (since _Subincision_ included non-threatening as well as threatening sequences). They also employed analysis of covariance procedures with a rest period baseline as the covariate.

Later, Lazarus and Alfert (1964) used the same film--silent, and with the three soundtracks--along with an introduction to the silent version which was designed to reduce threat. Then Lazarus _et al_. (1965) did a similar study but used a different film--_It Didn't Have To Happen_, an industrial safety education film.

Another group of researchers, Alexander, Clemens and Goldstein and their associates, have been using a number of psychophysiological measures in connection with commercial fiction films to study the responses of normal and disturbed subjects. In a study of hyperthyroids (Alexander _et al_., 1961), they used 19 subjects--seven acute hyperthyroids, seven treated hyperthyroids, and five controls. Their measures included neck counts of the radioactivity of the thyroid gland, respiration, skin resistance, finger-pulse volume and heart rate, PBI blood sample tests, and a post-viewing psychological battery of selected Rorschach cards, TAT cards and a word association test. Of major interest to this study was their report that the predominant finding involved the GSR over other autonomic measures. Their choice of films was also interesting. They used a 20 minute travelog of pastoral life on an Australian sheep ranch to obtain a resting base line. The stressor film was a 100 minute French commercial film with English dialog entitled _Wages of Fear_.

In a later study (Goldstein _et al._, 1965), _Wages of Fear_ was presented twice to emotionally disturbed persons and to controls (a total of 8 males and 24 females). Of interest here is their conclusion that "skin conductance was found to be the most sensitive indicator of the stress response and of individual differences in stress response" (p. 300). Measures used included skin conductance, heart rate, finger pulse volume and respiration rate.

Sternbach (1962) was interested in a technique for measuring emotional response. He showed ten 8-year old children the Walt Disney film _Bambi_, noting primarily the children's responses to a sad scene (the death of Bambi's mother) as well as responses to frightening, pleasant and humorous scenes. He photographed the children through a one-way screen in addition to using the following autonomic variables: skin resistance, gastric motility, respiration rate, heart rate, eyeblink rate, and finger pulse volume. The autonomic responses showed little consistency of reaction to the various scenes. However, while he expresses surprise that even in the "saddest" scene only skin resistance and eyeblink rate seem to be differentiating variables, it is significant for our purposes that skin resistance was so listed.

Block (1962) showed 80 college women the film Steps of Age while recording their skin resistance. The film is sympathy-inducing, featuring problems of the aged. Block then factor analyzed the data, as will be discussed later.

Handlon et al. (1962) report on using Disney nature-study films to study different levels of emotional arousal. Their index involved using plasma 17-hydroxycorticosteroid levels, but of interest to us is their finding different results with bland and emotion-inducing films.

Becker (1963, 1964), a communication researcher, tested methods of recording "interest" in television programs. He used three measures: GSR, a push-button method in which the subject held down a switch until the TV program was interesting (a program analyzer type of instrument; see Twyford, 1953a,b), and a paper-and-pencil method in which subjects were to check their degree of interest on a rating sheet whenever numbers corresponding to rating scales were flashed beside the screen (every 30 seconds). Subjects were 5th grade students, assigned to the three treatment groups, with groups of 31, 27 and 32. Stimuli were two half-hour TV programs which were part of a fifth grade social studies TV series. One program was on the Constitution of the United States, the other was on the United Nations. Both were essentially illustrated lectures. Subjects were exposed to each program a week apart. Becker's findings indicate that GSR showed a consistent negative relationship to the other two measures (however correlations are not high). Correlations between these measures and a measure of knowledge gain (difference between pre-retention and post-retention tests as well as to the measure of post-retention) were not significant. This suggests to Becker that factual learning is not closely related to audience "interest." One of his findings indicates that shots of the performer were associated with surprisingly high GSRs. Becker offers the suggestion that this might be due to the children seeing the performer as an authority figure. He also found that intersubject reliability was highest for the GSR method over the other two television measurement methods.

There are two questions to be raised with respect to Becker's study. The first concerns why he didn't amplify his statement,

> One of the serious problems encountered in this study was the number of factors which could prevent the obtaining of a valid GSR profile. Because of this problem, in large part the result of inadequate pretesting with the particular polygraph used in the study, a large number of GSR graphs had to be discarded. (1963, p. 11)

With all the difficulties attendant on use of the GSR, further information about the problems he was having would help us better interpret his results. As it is, some serious question can be raised about his GSR results. Our second question concerns his choice of measure. Becker used only the existence of a GSR as his measure (corresponding to a measure of the number or frequency of GSRs). Becker does not define the amount of resistance change required to measure one such response. While this is a measure of GSR response, it will be seen later in this report that other GSR measures, especially base level and amplitude, are independent measures especially useful with film stimuli.

Becker's restriction to the one measure may be legitimate, but it does limit the generality of his conclusions. One wishes he had recongized this limitation, or that subsequent abstracts of his study would note it.

Testing persuasive communication with autonomic measures has increased with the interest of advertising researchers. Following the findings of Hess and his associates (Hess and Polt, 1963; Hess, 1965; Hess, Seltzer and Shlien, 1965) concerning eye pupil measurement as an indication of interest, attitude change and like-dislike, a commercial concern, Marplan, has begun a program of testing television programs by pupilography (Krugman, 1964, 1965).

Cronkhite (1965a,b, 1966) was interested in testing whether subjects introduced to differing degrees of "cognitive dissonance" would experience corresponding differences in autonomic arousal, and then to observe if they showed corresponding differences in the extent to which they used available means of "dissonance reduction." Fifty-six college students were exposed to a message advocating admission of Communist China to the U.N. which was credited to John Glenn (American astronaut), a favorable source. It was predetermined which subjects were consonant to the message and which were dissonant. Heart rate and skin conductance were recorded. Cronkhite's findings did not support the theory that it is "dissonance-produced drive" which intervenes in a dissonant situation to produce "dissonance-reducing behavior."

Cronkhite points out that technical problems made his GSR records unsatisfactory. His equipment did not permit him to measure changes in base level skin resistance, so he had to be content to use only GSR frequency (number of GSRs). As with the Becker study cited above, it is possible to raise some question about the broad application of GSR results which use only this one measure. As will be discussed, it is obvious from the literature that there is more physiological support for using base level and amplitude measures (Martin, 1961; Montagu and Coles, 1966; and others). Further research is needed on the relationship of the number (or frequency) of GSRs to other GSR measures, as well as to the underlying psychophysiological factors. But Cronkhite is to be commended for so directly stating his difficulty.

Zimny and Weidenfeller (1962, 1963) report on the effects of music on GSR, and on GSR and heart rate. They wanted to investigate the "emotional" effects of music previously judged to be exciting or calming. In one study

(1962) elementary school children heard recorded music, while GSR measures were taken. Findings indicate that music judged to be exciting and music judged to be calming produced differential changes in the GSR. Their GSR measure is uncertain. They speak of the "number of reaction units." It is presumed that this is the frequency of GSRs since they mention that their instrument did not permit the determination of a basal level. This same GSR measure was used along with heart rate in another study (1963) using 18 college students. Here they felt their hypothesis partially confirmed with respect to the GSR, but not with respect to heart rate.

Cooper (1959) reports on the three studies he did to test the idea that prejudicial attitudes are affectively supported, that is, that relatively strong prejudicial attitudes are supported by relatively high levels of "emotion." All three studies used college students and GSR recordings. The details of the studies can be read in the reference and, for the third study, in Cooper and Pollock (1959). In the first study, GSR was measured only on a dial, and amplitude measures were estimated from it, although they declare this procedure made it difficult to compare subject to subject. The later studies used a recording polygraph and took amplitude and largest GSR amplitude measures. Findings of all three studies supported the hypothesis.

Vidulich and Krevanick (1966) also tested the degree of "emotional support" of strong racial attitudes. Twenty male and twenty female subjects who evidenced high and low negro prejudice were shown 15 photographs, some of which featured negro and white interaction. GSRs were recorded. The GSR measure used was a standardized form of mean amplitude. Results supported their hypothesis that persons with high anti-negro prejudice would exhibit greater GSRs than low-prejudice individuals to photographic stimuli with negro content than to non-negro stimuli.

There are a number of studies which measure the relationship of GSR and other autonomic measures to induced attitude or attitude change. Some of these will be briefly noted to give the reader an idea of possible uses of these measures in such areas.

Gerard (1964) reports a number of studies he performed using skin conductance while testing the strength of subject's attitudes when confronted with group disagreement. He also used finger-pulse amplitude to test one aspect of cognitive dissonance theory.

Kaplan _et al_. (1963) used GSR frequency and amplitude in a test of the effects of variations in interpersonal relations in small groups upon the GSR. Their feeling that GSR is related to the kind of social activity in which one may be engaging and the nature of one's interpersonal relationship with the person toward whom one's behavior is directed leads to their conclusion that GSR and similar measures may have great use in studying interpersonal relationships.

Other examples of testing aspects of cognitive dissonance theory with autonomic measures are McNulty and Walters (1962) and Ward and Carlson (1964). Another example of using galvanic skin potential to study group interaction is found in Leiderman and Shapiro (1963).

Bingham (1943) used the GSR (percentage increase of GSR response) to test subjects' response to the meaningfulness, significance and importance of words. His findings indicated the GSR was reliably greater for very meaningful, significant and important words over those rated only slightly so by the subjects.

The preceding survey of literature related to the GSR indicates the uses (and misuses) of this instrument in psychological and communication research. It shows that there is wide use of films as stimuli for such studies.

It should indicate that research with psychophysiological measures is a promising area for communication researchers and behavioral scientists.

A Salient Study

One study will be discussed under separate heading since it is uniquely relevant to this research. The study is an M.A. thesis done at the University of Southern California and not published. A critical examination of the study may find something to be desired in its design and methodology. This is not so important here as is the problem which was investigated and some of the tentative conclusions reached.

John Humphrey (1950) wanted to test the physiological effects of abstract motion pictures on an audience, to determine "whether or not the basic material of motion pictures--motion--does have a psychological effect" (p. 1). He used 30 male and 20 female university students as subjects. Treatment films were a series of eleven white objects photographed against a black background. These objects included such things as a white ball moving toward subjects at varying speeds, spirals turning, balls moving away, bouncing, falling and rotating, a cube, and a gauze-like cloth billowing. Humphrey interpreted the motions in terms of the emotions he felt they would produce. For example, the ball coming at the subjects might produce emotions of fear, falling balls would incorporate fear of loss of support, the billowing gauze would be lust or the sexual emotion. Subjects had their GSRs recorded while viewing the films. They also gave subjective answers to describe what they felt. Humphrey interpreted these in relation to the expected emotion. He feels that the motions did definitely produce emotional response, but that the subjective answers were so diversified "it would be impossible to predict any definite relation between the motion and the emotion desired. That the motions did produce emotional reactions is true, but what emotion they produced or will produce in a particular group or in a particular individual is unpredictable without further investigation into the field" (p. 58). One of his conclusions is especially pertinent to this study. "The motions themselves produce emotional reactions in people and can therefore be used to supplement and complement the subject matter stimulus" (p. 62).

For his GSR measure, Humphrey recorded basic resistance on a scale of 1 to 20, then reinterpreted these to ohmic values. He used these base level values and the average change of these levels. From his brief description this would appear to be a coarse, but usable, measure.

This study is the only study which attempts something parallel to this study. Additional work along this line should be done to relate pure abstract motions or forms to subjective feelings. However, it will be necessary to distinguish those which have a physiological basis (for example, the falling ball) from those which might get their effect from a learned cultural connotation (as might be the case with the waving bit of gauze suggesting sexuality). It is unfortunate that the study was not designed to more accurately discriminate the emotions involved, and especially their relationship with GSR as a measure of emotional response. Part of the problem, of course, is simply that it is virtually impossible to label a particular emotion on the basis of GSR response alone. A larger question which might be answered in the future is to what extent abstract motions, when chosen because they seem to portray a particular emotion, and which give some indication of so functioning when used alone, will function when used in the context of an actual motion picture film where non-formal qualities may dominate as emotion-producing stimuli.

Humphrey has shown that motions selected for their emotional connotation may produce emotional response, although this response is admittedly diffuse. He did not demonstrate that motion in general can have this effect, which is one of the purposes of this study.

If this review of the literature shows little upon which this study may build, it does show that there is a rich field of theoretical material which might lack only empirical evidence to bind it together. That this material comes from a variety of research and academic areas is in the tradition of communication study.

CHAPTER III

EXPERIMENTAL DESIGN

Summary

A film judged to be of sufficient quality to justify its presentation, yet of relatively neutral subject matter was chosen. This film was Corral, a short produced by the National Film Board of Canada in 1954. Since this film had only a music soundtrack, a narration was written which presented factual material about which subjects could be quizzed. This was added to the music track. A filmograph version of the film was prepared as the non-motion treatment variable. Since there was interest in possible order effects, these versions were intercut. Thus there were four treatment films: motion (MM), filmograph (FF), half motion and half filmograph (MF), and half filmograph and half motion (FM). These are diagrammed below. By comparing versions MF and FM order effects could be detected.

```
                  1/2
MM ==================/=====================

FF ++++++++++++++++++/+++++++++++++++++++++

MF ==================/+++++++++++++++++++++

FM ++++++++++++++++++/=====================
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A questionnaire was prepared to test subjects' responses. This consisted of a pre- and post-film semantic differential measure, an attitude test of Likert-type items, and an information retention test.

The experiment was run over a two-week period in August, 1965, at the Veterans Administration hospital in Sepulveda, California. Volunteer subjects were obtained from nearby schools and communities.

A GSR instrument was located which could handle up to five subjects at one time. (This instrument was located at the VA hospital and hence the necessity of using those facilities.)

Results were analyzed with respect to the hypotheses and to other questions relevant to the study.

The Film

A number of assumptions were made with respect to choice of the treatment film. It was felt more desirable to use an existing film rather than to produce one specifically for this study since this would eliminate a possible source of experimenter bias and provide a certain external validity. It was felt the best choice would be a film of neutral subject matter, relatively realistic structure, yet one which included a great deal of motion and filmic rhythm. A film of controversial subject matter would be inappropriate since it might elicit audience response based on individual prejudices. Such a response might overwhelm any response to film movement for those individuals so affected. A film with realistic structure would be a better choice than an abstract film, since although the latter frequently depends on a reaction to form and movement as form for its effect, it could introduce some problems. One problem is the highly individualistic response these films elicit--some people like them, others violently oppose them. Another problem is that such a film represents a minority of the film-viewing experience of most people. It is equally rare in the instructional film field. It was felt a film of some general appeal would be more desirable.

In order to test the effect of motion on the viewer, the film should be one which features a great deal of motion and activity. It should have some rhythmic moments. It should be an interesting film capable of holding the attention of a general audience. The film chosen to meet these qualifications is Corral.

Corral is a black and white film about 12 minutes (400 feet) long. It was produced by the National Film Board of Canada in 1954. The film has won a number of awards, including the following:

> First Prize, Documentary Films,
> International Film Festival, Venice, Italy.[1]
>
> Second Award (Bronze Medal), Documentary Section,
> International Film Festival, Durban, South Africa.
>
> Diploma of Merit, Art Category,
> International Film Festival, Edinburgh, Scotland.
>
> Special Mention, Theatrical Shorts,
> Canadian Film Awards.
>
> Recognition of Merit, Cultural Value Shorts,
> Golden Reel Film Festival, Film Council of America,
> Chicago, Illinois.

Its titles and introductory statements have been translated into the following languages:

- Arabic
- Danish
- Dutch
- German
- Indonesian
- Italian
- Portuguese
- Russian
- Spanish
- Turkish

The film has received wide distribution in theaters, over television, and by print sales in many countries. A conservative estimate by the National Film Board is that at least 500 prints have been made. The film has also received wide distribution in schools and libraries in a number of countries.

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[1] No dates were furnished on this information supplied by the National Film Board of Canada. It may be presumed these are for 1954 and years just after this.

The film is the story of a cowboy breaking a half-broken horse on a Canadian ranch. The cowboy rounds up and corrals a group of horses, cuts out the one he wants, subdues it, then mounts and rides it. There are two noticeably exciting sequences in the film. The first is in the middle of the film, overlapping both treatment halves, and features the cowboy lassoing the horse and subduing it enough to halter it. The second exciting sequence is in the second half when the cowboy mounts the horse and gallops over the plains until finally reining it to control. (A more detailed description of the film is found in Appendix I.)

A separate narration was recorded to present material about which subjects could be tested.[2] It was added to the music track of the film. A copy of this narration, listing at which points in the film it appeared, is found in Appendix II.

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[2] The narration is not noteworthy dialogue, but seemed satisfactory for the purpose. No subject commented that it seemed out of place in the film. On the attitude questionnaire it received a surprisingly high rating.

A filmograph was made from the film by choosing one or more frames from each shot in the film and printing them repeatedly (freeze-frame printing) for the length of that shot. Choices as to frames to use were made by the experimenter as objectively as possible. These were shown and discussed with two members of the Cornell University Tv Film Center who concurred with the choices. More than one frame was used to characterize a shot when a shot in the film included a camera movement such as a pan and hence the revelation of new content, or when movement of an object within the frame resulted in a significant new angle of point of view on the object. Since many of the film shots involved movement, still frames were chosen to convey, by their compositional arrangement, the impression of movement.[3] The result was a filmographic version of Corral. A breakdown of the frames used in the filmographic version is found in Appendix III.

One factor in the experiment was the background music which was retained with the film. It has been shown that GSR will measure audience response to music (Zimny and Weidenfeller, 1962; Zimny, 1963). In spite of the possibility of such response, with music the film treatments more realistically approximate actual film-viewing experience. The music in question is played by two guitars. A brief, exploratory analysis was made to test audience response to the music alone, and to the film without any soundtrack. This will be reported later.

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[3] This produced a criticism of the filmograph version. Some subjects felt that since so many of the still pictures used were action shots, the major figures in them were often blurred.

Selection of Subjects

Since this experimenter did not have available a stable resource population from which to draw subjects, he was dependent upon volunteer subjects. It was at first felt that junior or senior high school students would be a desirable population from which to choose subjects, but this proved infeasible because of parental objections to the use of an instrument such as the GSR, and because of the need to transport subjects to a distant test site. Subjects were solicited from classes at universities and colleges in the Southern California area and from adult acquaintances of friends of the experimenter. Student subjects came from a range of majors, with most from Education or Psychology.

Subjects were paid $3.00 for participating in the study.

Four of the original subjects were eliminated from analysis. Three of these were eliminated due to difficulties with their GSR records. (Two subjects had faulty records when, on responses, their marker pens dropped off the chart and the operator was not able to correct before a significant amount of data were lost. The third subject recorded a base level which rose beyond the 240K ohm upper limit of the instrument.) One subject was arbitrarily eliminated to reduce the number of subjects per treatment group to 20 each.

There were four treatment groups of 20 subjects each. Composition of the groups, along with the results of chi square tests (of 3 df each) to determine if groups were homogeneous, that is, chosen from a single population, is shown in Table 1 on the following page.

An analysis of variance was also performed on Age as part of the general analysis. It indicated that $F=2.43$, 76 df, $p<.10$. A Newman-Keuls test (Winer, 1962) at the .05 level was not significant, but indicated that group FM was an older group than MM or MF.

This indicates that treatment groups came from the same population with respect to sex, are not from the

TABLE 1

COMPOSITION OF TREATMENT GROUPS

Groups	Students		Sex		Age	
	Students	Non-Students	Males	Females	Under 28[a]	Over 28
MM	17	3	12	8	19	1
FF	10	10	7	13	15	5
MF	19	1	10	10	18	2
FM	13	7	9	11	13	7
	$\underline{X}^2=12.6$	$p<.01$	$\underline{X}^2=2.61$	NS	$\underline{X}^2=7.47$	$p<.10$

[a] Age 28 provided a natural division and hence convenient in presenting these data.

same population with respect to proportion of students, and at the .10 significance level are not from the same age population. It is uncertain how this might have affected results.

It was impractical to randomly assign subjects to treatment groups as testing had to be done in the evening and at times convenient to each subject. So treatments were randomly scheduled and subjects were assigned to treatments on the basis of their availability.[4]

Measuring Instruments

With the exception of the GSR which is rather new to communication research and therefore will be discussed in detail, the other measures used in this study are familiar research instruments and will be only briefly introduced.

Along with the demographic information already discussed, subjects were asked questions about their knowledge of Canadian ranch life, whether they had travelled extensively in Western Canada, and about their knowledge of such topics related to the film as cowboys and horses. It was felt that anyone intimately familiar with the subject matter of the film might bias results. A few such subjects would not be disturbing if they were evenly distributed among the treatment groups, but would be a possible confounding effect if they were concentrated in one treatment group. However, only two persons were found who were particularly knowledgeable in these areas, one person in group MF and one in group FM.

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[4] Since each group consisted of 20 subjects, and only five subjects could be scheduled for any one session, this meant that there were at least four different schedule times for each of the four treatments.

The following three items composed the remainder of the questionnaire, a copy of which will be found in Appendix IV.

Semantic differential

The semantic differential (Osgood, Suci and Tannenbaum, 1957; Osgood, 1952, 1962; Moss, 1960) is an instrument devised for observing and measuring the psychological "meaning" of concepts. Assuming meaning was an internal judgment made by the individual, Osgood conceived of this process of judgment being made to place a concept on a set of continua, each limited by a pair of bipolar terms. Many of these continua are similar and can be represented by a single dimension. Thus a limited number of these continua can be used to specify the meaning which an individual has for any concept.

The semantic differential measures the connotative meaning of concepts as points in "semantic space," a Euclidean region of some unknown dimensionality. Each semantic scale, defined by a pair of polar adjectives, represents a straight line function that passes through the origin of this space, and a sample of such scales represents a multidimensional space. Differences (or similarities) of meaning of two concepts may be compared as the differences of their loci within semantic space. Osgood recommends using seven-step scales to define this space.

Three dimensions appeared in factor analytic studies of various bipolar adjective combinations, leading Osgood to conclude that there are three major dimensions of connotative meaning. These are Evaluation (e.g., good-bad), Potency (e.g., strong-weak), and Activity (e.g., fast-slow). In subsequent studies, these three dimensions stand up remarkably well as being sufficient to define the meaning of a concept.

The evaluative dimension is the most significant or powerful, accounting for the largest part of the variability in meanings. It is used increasingly as an operational definition of attitude. Osgood suggests that studies involving measure of attitude or attitude change utilize only this dimension. This has been done in this study.

For this study, fifteen scales were used with each concept. Potency and Activity scales were intermingled with Evaluation scales to help mask the purely evaluative purpose of the measure. The scales were randomly reversed in polarity. Their order was also randomly determined. Scales chosen for use were those which received high factor loadings in their respective dimension in the studies reported by Osgood, Suci and Tannenbaum. In addition, the scale friendly-unfriendly was added as relevant to the concept COWBOY.

One of the fifteen scales--light-heavy--was repeated in reversed form (scale 1 and scale 11). This was used as a quick check on the reliability of marking. While correlations computed between these two items were .79, .75, .76 and .75 for the four concepts, these should not be taken as a measure of low reliability, for as Osgood, Suci and Tannenbaum point out, the correlation coefficient does not take into consideration the absolute deviations or errors. A visual check of these absolute deviations showed high evidence of reliability.

Four concepts were chosen for rating: RANCH, A FILM, COWBOY and CANADA. COWBOY refers to a dominant character in the film, RANCH and CANADA represent the film settings, and A FILM was included as a measure of attitude toward film in general. Subjects rated each concept before seeing the film,then again immediately after seeing the film, the difference in rating pre- and post- being taken as a measure of attitude change produced by the treatment films.

Factor analyses were performed on the pre- ratings of each concept to determine the evaluative scales.[5] In addition, a factor analysis was performed across all concepts and scales to get an approximate to a generalized evaluative set of scales for this study. The results were then used in the analyses. These results will be reported later.

Copies of the semantic differential pre- and post- sheets are in the questionnaire in Appendix IV.

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[5] Although Osgood identifies a number of scales of evaluative dimension, there is evidence for the necessity for specific factor analysis because of concept scale interaction. This is discussed by Smith (1961) and Darnell (1966). The results of the factor analyses in this study also support this contention.

Summated Attitude Scales

Summated attitude scales (also referred to as Likert-type scales) were prepared to test subjects' reactions after viewing the film. This form consisted of a set of items on various topics related to the film and its content to which subjects could give an intensity response on a five point scale. These scales were then summed and averaged to yield individual attitude scores (Kerlinger, 1965).

Factor analyses were performed on the item scores and attitude dimensions were defined.[6]

The exigencies of the experimental testing situation permitted only minimum pre-testing of the items on the questionnaire. Questionnaires were already then reproduced and it was too late for ambiguous items to be eliminated. Subsequently a number of items were eliminated from the questionnaire before statistical analyses. Items 5 and 7 were eliminated as their three-point scale was not able to be conveniently changed to five-point scale ratings. Items

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[6] It should be clearly established that the purpose of this study was to tap an immediate--and perhaps evanescent--attitude response to the items for treatment comparison, and not to determine some underlying population attitude.

11, 12 and 13 were eliminated for this reason, as well as for the difficulty of determining a neutral point. The write-in answer items on pages A4 and A5 of the questionnaire were used only for additional information and with the problem of obvious scoring difficulties were not used in the analysis. An exception was question 2, "What do you consider the most exciting part of the film?" It was analyzed separately and will be reported.

Factor analysis identified 8 attitude factors which are tentatively labeled the following:

1. Amount learned
2. Film music
3. Film narration
4. Film appeal
5. Cowboy in real life
6. Cowboy in the film
7. Visual film techniques
8. Instructional narrative

These factors will be discussed later.

The attitude questionnaire is included in Appendix IV.

Information Retention Test

An information retention test was prepared based primarily on the prepared narration but also including material from the visual film. The test (found in the questionnaire in Appendix IV) contained 22 multiple-choice items and ten short-answer items. A number of items were eliminated, reducing the total number for analysis to 26 items, of which 11 dealth with material from the first half of the film, and 15 dealt with material from the second half of the film.

Since a filmed introduction to the experiment was eliminated, item 7 became an opinion item rather than an information retention item (it asks an estimate of the length of the film). It was scored separately. Item 16 was eliminated as it was not possible to assign it to a specific half of the film. (Visual inspection of responses to this question indicated the group responses were very close.) Of the short-answer items, questions 3, 5 and 10 were eliminated as the questions proved ambiguous or answers difficult to score. Questions 6 and 8 were eliminated as answers to these could not be assigned to a specific half of the film. Question 9 requires a two-part answer; this was then treated as two separate questions, with one scoring point possible for each. Subjects were given separated summated scores for each half, as well as a total summated score.

The GSR

The GSR is an instrument which measures intensity of involvement or emotional response, or, more accurately, it measures level of arousal or level of activation. It has the advantage over verbal and written responses in that the subject has little control over the response, hence it is a truer response (as accurately interpreted). In this study it is used as an indication of audience involvement, or of "emotional response."

GSR usage is closely tied to the newer activation theory of emotion. Notably advanced by Lindsey (1951) from his observations of the electroencephalogram, this theory has been expanded by others as an approach to that elusive concept "emotion." Briefly, this theory suggests that emotional states are characterized by a general pattern of sympathetic discharge, plus a cognitive factor which permits the identification and labeling of the state (Schacter, 1964; Woodworth and Schlosberg, 1954: Martin, 1961; Malmo, 1959, 1962; Duffy, 1962).

Background for the theory came from the findings of neurophysiologists working in electroencephalography (EEG) and discovering that there were distinctive wave patterns characterizing the levels of subjects ranging from deep sleep through drowsiness to moderate alertness and highly alerting and exciting conditions. This suggested a mechanism in the brain mediating alertness or arousal functions. Recently, such a mechanism was discovered in the ascending reticular activating system (ARAS), a mass of central nervous system cells in the brain stem responsible for both cortical and behavioral activation. Rapid findings followed, including the knowledge that stimulation of the ARAS produced behavioral alerting and activation of the cortical EEG, while lesions in the ARAS abolished the presence of "activation" in the EEG and produced behavioral somnolence. These findings supported Lindsey's proposal that emotion and motivation be considered as aspects of activation, and that this activation be measured autonomically.

A related phenomenon is the observation that there is cortical feedback to the reticular formation (Lindsey, 1957; Morgan, 1957; Hebb, 1955; Magoun, 1958). Thus the cerebral cortex, in its discrimination of complex visual or aural cues, is capable of facilitating or inhibiting the action of the reticular activating system.

The GSR[7] is one of the most popular psychophysiological measures of activation level. Its popularity is due partly to the simplicity of its instrumentation, but, as stated by Martin (1961) due "largely to the extreme sensitivity of the GSR to sensory and ideational stimuli" (p. 423). It is, as claimed by Woodworth and Schlosberg (1954) "perhaps the most widely used index of level of activation" (p. 137). And it is claimed by Montagu and Coles (1966) as "the most sensitive physiological indicator of psychological events available to the psychologists" (p. 261).

Two methods can be used to record the bioelectric activity of the skin. The resistance method first discovered by Féré (1888) measures the drop in electrical resistance of the skin to the passage of a slight applied current. This method has been most popularly used, and is the method used in this study. It is also possible to use the method of Tarchanoff (1890) which does not use an external source of current, but measures the change in the natural potential difference between two areas of the skin. In recent literature this method is referred to as the galvanic skin potential (GSP) (for example, see Leiderman and Shapiro, 1964; Shapiro and Leiderman, 1964). There seems to be some uncertainty of the quantitative relationship between the two measures (Montagu and Coles, 1966), but either is effective (cf. Burstein _et al_., 1965). Since the skin potential measurement was not used here, it will not be discussed further.

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[7] The galvanic skin response (GSR) is currently the most commonly used name for the phenomenon. An older name is psychogalvanic reflex (PGR), but this is rarely used today since it implies some inaccurate properties of the index. Electrodermal response (EDR) is considered safest by Woodworth and Schlosberg (1954), but has not become so generally popular.

After a period of various theories about the peripheral mechanism associated with the GSR, including muscular and vascular theories, it is now recognized that the secretory theory which attributes the GSR entirely to changes in the sweat glands is the correct explanation. It is mediated through the sympathetic cholinergic nerve supply to the skin (Montagu and Coles, 1966; Woodworth and Schlosberg, 1954). Forbes (1964) rather succinctly simplifies a description of the GSR measure:

> . . . the electrodermal phenomena which are commonly measured and used as indicators of psychological

> functions, are the result of permeability changes of membranes in the sweat glands and possibly in other structures within the skin. These semi-permeable membranes allow certain ions in the body fluids to pass while others do not. This sets up a difference in electrical charges carried by these ions and thus results in a "basic potential level." The differences in potential (voltage) from this source can be measured on different parts of the body and are usually referred to as endosomatic potential levels.
>
> Also resulting from the passage of some ions and not others, is an "apparent resistance" to electrical current which is sometimes referred to as "skin resistance level." This apparent resistance can be measured with direct current. A similar phenomenon known as "impedance" also occurs when alternating current is used for measurement. The impedance to alternating current involves both a resistance and a capacitative reactance phase. (p. 27)

As a measure of the level of activation, skin resistance decreases (or conversely, conductance increases) with a rise in activation. Thus it has been found that palmer conductance is low during sleep, rises to a maximum during midday, and falls again in the evening. In response to stimuli, studies have shown that GSR is dependent on both the intensity and the novelty of the stimulus. And studies have shown consistently high correlations between GSR and reported strength of emotion. (These findings are summarized in Woodworth and Schlosberg, 1954).

The usual method of recording the GSR uses two electrodes placed on surfaces of the body such as the back and palm of the hand, on the fingers, or even on the feet.

A small current is passed through these electrodes, and the GSR is measured by an appropriate electrical circuit, frequently by a Wheatstone bridge circuit (see Woodworth and Schlosberg, 1954). The GSR resistance value may be read from a meter, or recorded by a number of recording methods such as inked polygraph recorder. It has been pointed out that the resistance so measured is not a true ohmic property but is rather an apparent resistance from a back electromotive force (EMF) caused by the applied current across the polarized sweat gland cell membranes (Montagu and Coles, 1966). There is also discussion about whether an ac or dc measure is preferable but Montagu and Coles conclude that the results obtained are comparable (if in terms of conductance and admittance, respectively). (See also Forbes, 1964) There is also discussion in the literature about the value of using a constant-current or a constant-voltage method of recording the GSR. Results by either method are highly correlated, although there is some support for the constant-voltage method being preferable (Montagu and Coles, 1966; Wilcott and Hammond, 1965).

This study utilized five identical GSR bridge units specially constructed for the study.[8] These were Wheatstone bridges individually energized by 45 volt batteries. Current through the subject was limited to no more than 10 microamperes. Each bridge was made up of two 3-ohm resistors, one of which was in series with the subject, the others in series with a balancing network. The balancing network consisted of a 23 position switch with 10,000 ohm resistors between each contact so the experimenter could select in 10,000 ohm steps from 0 to 220K ohms. Fine adjustment consisted of a 10,000 ohm 10-turn precision potentiometer in series with the coarse adjustment (23 position) switch. Calibration was performed by shorting across a 1,000 ohm resistor in series with the subject. Linearity of the bridge was accurate enough due to the fact that it was operating at essentially a constant current.[9] Biocom claimed the 1K ohm calibration remained constant from 10,000 ohms to over 100,000 ohms (although this investigator experienced difficulty interpreting this value on subject records due to its fluctuation with resistance level and recording channel location.)

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[8] These units were constructed by Biocom Corporation, Culver City, California.

[9] Although a schematic diagram of the units was requested from Biocom subsequent to the experiment, it was not furnished.

Amplifiers were Offner type 133. Recording was made on a 6 channel Offner Dynagraph type 506/501K, Series 119.[10] Recording was at 1mm/second.

Electrodes used were Grass silver-silver chloride EEG surface electrodes, Number 101 4219. Electrodes were applied with bentonite paste as the electrolyte.

The GSR and similar autonomic measures are receiving more and more attention in communication. To this investigator, this is a commendable trend. One aspect of this study is to explore this potential. But it should be cautioned that GSR is not a simple measure. It can be very easily misused by the casual researcher, as has been mentioned in connection with some specific studies already cited. Some of these difficulties encountered with use of the GSR will now be considered.

The choice of appropriate electrode is important. When current passes from a metallic conductor to a saline solution, polarization results, unless that metal is in contact with one of its own salts. Polarization refers to the generation of a back electromotive force (EMF) which behaves as an apparent resistance and can influence GSR readings. This is one of the problems to be considered in the choice of a suitable electrode and electrode paste to complete the contact. Lykken (1959) suggests that silver-silver chloride electrodes are generally unsuitable and suggests zinc electrodes used along with a zinc sulphate paste. Edelberg and Burch (1962) suggest that a zinc sulphate paste may be undesirable as it may damage skin membranes with prolonged use. They recommend a cornstarch-sodium chloride mixture which approximates sweat. The two sources quoted present a good discussion of electrode choices.

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[10] One of the channels was inoperative limiting use to five channels.

Application of the paste or electrolyte is also important since the effective electrode area is the total skin area wet with electrolyte. Lykken (1959) suggests using a corn pad along with the electrode, and using just enough paste to fill the corn pad. Unfortunately, such care was not exercised in this study since this experimenter was not at that time aware of the problem, but relied on his consultant. So an imprecise amount of paste was applied to the finger, the electrode placed on it, then wrapped with adhesive tape. Since Lykken's findings indicate that values obtained are a direct function of the total skin area wet with electrolyte, this is a potential confounding factor. It can be said, however, that at least approximately the same amount of paste was used in each application.

With respect to preparation of the site of electrode attachment, it is generally recommended (Lykken, 1959; Montagu and Coles, 1966) that a simple soap and water wash is sufficient, although Lykken also suggests a slight sandpapering of the site. Montagu and Coles advise against a grease solvent such as carbon tetrachloride. In this study, sites were cleaned with rubbing alcohol prior to attaching the electrodes. This experimenter is not, at this time, able to comment upon the feasibility of this procedure. He has not found it discussed in recent literature. (Alcohol cleaning was used by Dysinger and Ruckmick, 1933, but theirs was an early use of the equipment and cannot be used for comparison.)

Among other variables which can potentially affect GSR are temperature and humidity. Some studies have found no effect of temperature on the GSR, but other studies indicate some may exist, especially when skin temperature is involved. Both Edelberg and Burch (1962) and Montagu and Coles (1966) suggest the need to control temperature. A number of studies have found no evidence of a relationship between humidity and skin conductance, although there are some contrary findings here (see Martin, 1961, and Montagu and Coles, 1966). Under the conditions of this study it was impossible to control for these factors. Nevertheless they were fairly consistent. Temperature ranged from 87 degrees F. to 93 degrees F. with a mean of approximately 90 degrees F. Humidity ranged from 36% to 48%. It is not felt these ranges would seriously affect the GSR results.

Time of day is a factor that affects GSR readings. In this study it was held reasonably constant as subjects were tested between 8:00 p.m. and 10:00 p.m. With respect to other factors, there is little indication that such variables as age, sex or intelligence (of normal subjects) affect GSR results. (A summary of these findings is presented in Montagu and Coles, 1966.)

One phenomenon present when recording the GSR is the adaptation or habituation effect. The GSR tends to diminish in size with repetition of the stimulus (Woodworth and Schlosberg, 1954; Martin, 1961; Montagu and Coles, 1966). This is understandable since the strength of the GSR depends on both the novelty and intensity of the stimulus. What significance this phenomenon has for this study and other experiments which use time-ordered stimuli such as films is uncertain. Certainly, the force of this effect in such cases would depend on the varying intensity of the stimuli presented and the variation of such stimuli. In the case of a film, especially one dramatically structured to build to a climax, any evidence of habituation would be working against the dramatic effect. This is a subject for further investigation.

There are a number of questions which come up with respect to measurement of the GSR. One question concerns the unit of measurement. Most circuits are designed to read GSR in units of resistance (ohms), but there are convincing arguments for changing this to its reciprocal, conductance (mhos, or, more generally, to the micromho, where a micromho of conductance corresponds to 1,000,000 ohms of resistance and is obtained by multiplying ohmic values by $1/10^6$). Darrow (1934) found that the amount of perspiration varied with the conductance of the area, so suggested a conductance measure. Later, Darrow (1964) found evidence of two distinctly different electrophysiological response processes occurring at high and low levels of resistance and overlapping in the middle range. He concluded that these two distinct measures may be combined to a single measure by using conductance units. Thomas and Koor (1957) showed that conductance varies linearly with the number of active sweat glands. Thus there is strong evidence to use conductance rather than resistance units of measure.

In addition to the above, there are a number of suggestions about transformations which can be made on the units of measurement to make them more statistically useful. Haggard (1945, 1949a,b) discussed this in terms of criteria for data for the analysis of variance: additivity, normality, homogeneity of variance, and independence of means and variables. He concluded that the logarithmic transformation (log conductance) is preferred. The square root transformation has also been suggested, although it is little used in the literature.

In light of the above, this experimenter decided to do the analysis on the three most commonly used units of measurement: resistance (ohms),[11] conductance (micromhos), and log conductance (log micromhos). With a few exceptions, all analyses were done on these units. This was not done, however, where impractical.[12]

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[11] In the statistical analysis later presented, resistance values are given in thousands of ohms.

[12] For example, a summation over subjects of each of the twenty-two sampled points of base level was done in resistance units since only the mean base level was

As a check on the statistical independence of base level measures in these units, correlations of the mean base level and the variance of the base level were computed. For the 80 observations of this study, coefficients were: resistance .51, conductance .25, and log conductance .31. This indicates greatest independence of base mean and its variance with the conductance measure.

Still another measurement problem with GSR is the consideration of what has been called the "Law of Initial Values" (LIV). Formulated formally by Wilder (e.g., 1958) the LIV states that the magnitude of an autonomic response to a stimulus is related to or dependent upon the prestimulus level. This fact presents a difficulty when trying to compare individual responses made at different prestimulus levels. Generally, LIV is stated as assuming that large responses are always associated with low prestimulus levels of activity, and conversely. The problem can be seen this way. Assume a resting subject has a certain constant level of resistance. This is his base level. If he

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recorded in conductance and log conductance units. Amplitude measure was not done in log conductance units because of the difficulty of computation. While factor analyses were done on all measures, a greater number of such analyses were done on conductance by choice of the experimenter.

is given a sharp stimulus, his resistance level changes abruptly as he responds with a GSR. He then returns to a new level (although he may return to his same base level) which is called a post-stimulus level. Generally, the LIV postulates that high pre-stimulus levels(e.g., low resistance scores) are accompanied by small responses, and conversely.

A great deal has been written about the LIV, and not all is in agreement. In addition to the work of Wilder (1958, 1962), John and Beatrice Lacey have written intensively on the subject and its relationship to autonomic measurement (Lacey, 1956; Lacey and Lacey, 1962). They have attempted to establish the LIV as a phenomenon to be considered in scoring autonomic measures. Lacey has suggested a score he devised, the Autonomic Lability Score (ALS), as a means of adjusting change response values to their prestimulus base. Other writers suggest a form of regression or covariance adjustment to handle this effect. (Lacey's ALS is basically a standardized form of regression adjustment.)

There is disagreement about the operation of the LIV. While evidence indicates there is frequently some relationship of response to prestimulus level, it is not consistent.

In their report of a long-term study on children's responses to a cold pressor test, Lacey and Lacey (1962) admit that they found many instances of reversal of the expected LIV effect. Heath and Oken (1962) suggest that a "Law of Final Values" as well as the LIV might be operating on some data they collected. In a later study (Oken and Heath, 1963) they stressed the need to use change scores in analysis, and found some support for LIV, although it was not consistent. Block and Bridger (1962) state that the LIV may operate independently for the individual and for the group. Hord, Johnson and Lubin (1964) tested to see if the LIV always operated in the expected way with different autonomic variables. While their findings indicate it did for heart rate and respiration rate (beta of the regression analysis less than 1), and that it held for GSR expressed as resistance, the converse of the LIV seemed to hold for GSR expressed as conductance. In a comment on this paper, Surwillo and Arenberg (1965) tested some heart rate measures and found that LIV did not hold for their data when using a control group (as used by Hord, Johnson and Lubin) if they took into account the phenomenon known as the "regression effect" (that is, the tendency for the measures at the extreme of a distribution, when replicated, to score less extreme or to "regress" toward the mean of the distribution). Block (1964) tested data with various transformations (resistance, conductance, log conductance, and percent) in analyses of variance of the difference of prestimulus and post-stimulus values, and in analyses of covariance of the same data, using both elevation difference and slope difference. His conclusions support the use of a regression analysis or analysis of covariance to handle the effect of prestimulus dependency rather than simply one of the tested data transformations. In a detailed statistical discussion, Benjamin (1963) also suggests a covariance analysis or regression adjustment to satisfy the criterion that the correlation between adjusted scores and initial level be zero.

Although the LIV is reasonably established, there are still others who feel that since its direction is uncertain, and may differ widely from individual to individual, and from group to group, it is inadvisable to correct for a predetermined effect. Without predetermining the direction of effect, however, one can still correct for whatever LIV effect may be present. This seems preferable to no correction. The best correction, then, is a regression (or covariance) adjustment designed to reduce correlation between base level and response to zero. (It may first be advisable to check this correlation to determine if such an adjustment is needed.)

In this study, adjustment was made on two measures, the largest GSR and the mean amplitude of GSR responses. In each case a regression analysis was performed and the residual (the difference between the original value and the value estimated from the regression line) was taken as the new adjusted value.[13] These values were obtained by using the Multiple Regression (MUREG) program of the Cornell University CUSTAT statistical system computed on a Control Data 1604 computer. For the largest GSR, the regression line was computed on the base level value at which it occurred.[14] For the mean amplitude of GSR responses such was clearly impractical since GSR responses were occurring at different base level values for different times on the same individual. Here the regression line was fitted to the mean base level for each individual.

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[13] Strictly speaking, the grand total mean should be added to each residual value to obtain the adjusted value, but since the effect of adding a constant to a value does not affect its use in the statistical analyses performed, and since the residual values were convenient for computer work, they were retained.

[14] This was done on scores for separate treatment halves, then the single largest adjusted GSR score of record was obtained within the computer program.

Adjusted values were obtained on resistance and conductance values. Correlations before adjustment (which virtually removed them) and beta values and standard errors of beta from the regression analyses are presented in Table 2 on the following page. These values indicate some support for the Law of Initial Values as it is usually expressed.

Still another question of GSR measurement concerns which measures are to be used. It is generally recognized that there are two major measures possible, the base level and the GSR (Martin, 1961; Malmo, 1958). (Montagu and Coles, 1966, prefer the expression "background level" to base level, but the latter will be used here as it more generally appears in the literature.) There are also a number of other statistically--and perhaps psychologically--useful measures possible. This study computed the following measures.

Base level is measured by averaging the general resistance level sampled at a number of points over time. In usual studies with the GSR (i.e., when testing a single discrete stimulus), this would be taken as a resting level, that is, the normal resistance level for a given subject at the particular level of his activation cycle. The

TABLE 2

LJV REGRESSION ADJUSTMENT

		Initial Correlation	Regression Beta Values	Standard Error of Beta
Largest GSR				
1st 1/2	R	.30	.061	.022
	C	.53	.151	.028
2nd 1/2	R	.56	.179	.030
	C	.47	.096	.020
Amplitude	R	.46	.023	.005
	C	.84	.076	.005

response from this base line to a presented stimulus is known as the GSR. Such a procedure is satisfactory when presenting a subject with a number of discrete stimuli the response to which can be clearly distinguished. However, with a continuous complex stimulus such as a motion picture which develops over time and presents continuous and changing stimuli, the base level is frequently a varying quantity. Therefore the mean base level, sampled at a number of points, may be a meaningful measure for group comparison. It would be less meaningful for individual comparisons since the mean base level score would include not only an individual's response to the film, but his normal "resting" base level as well, and this differs widely from individual to individual. (In group comparisons these have the tendency to randomize out.) It is possible to correct a stimulus base level score for a resting level score by a regression (covariance) adjustment as previously indicated. This was not done in this study since the exigencies of the experimental condition made it difficult to get an accurate "resting" base level. A somewhat analogous technique, although admittedly not the same, was used in the covariance analysis of mean base level as will be described later. In this study the base level mean score was obtained by averaging across 22 equidistant arbitrary sampling points throughout the recording (11 points during each half of the film). These were approximately half a minute of film time apart. They were averaged for a mean base score for the total film, as well as for each half of the film. In resistance units (ohms), these scores ranged from 18.86K to 213K, and in conductance units (micromhos) from 53.37 to 4.71.

An amplitude measure was taken of each GSR response from the base level line. This was a measure of the difference between the pre-response base level and the lowest point of response of the GSR (where a dip in the recording pen indicated a drop in apparent skin resistance). The mean of all such GSR responses for each individual is that individual's mean GSR amplitude score. This was computed for each half as well as for the entire film. Mean amplitude scores were computed in resistance and conductance units.[15] Individual responses ranged from 1,000 ohms resistance (the smallest response which the experimenter accepted) to approximately 99K ohms resistance.[16] In resistance units (ohms), mean amplitude scores ranged from 1.0K to 10.38K, and in conductance units (micromhos) from .004 to 5.39. (Amplitude scores were corrected for mean base level, as previously described.)

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[15] The difficulties involved explain why log conductance measures were not also computed. (Besides, it was felt that they were not required.) To compute conductance measures, each individual amplitude score had to be changed to a conductance unit from a resistance unit, then the mean taken for individual score totals. One does not simply obtain a mean amplitude resistance score and take its reciprocal.

Amplitude values were determined by the experimenter measuring each individual GSR response for a recording. As a quantitative measurement scale for determining the value of each response, the investigator used the 1,000 ohm calibration which was placed at the beginning and (usually) at the end, of each record. An even more useful measurement scale was furnished by the 10,000 ohm adjustment steps which appeared in the recordings. It worked this way. The effective range of the GSR recording channel was in the vicinity of 15K to 20K ohms in either direction from the middle of the channel. If a subject gives a response greater than, say, 15K ohms the recording pen drops to near the edge of the channel in which this subject's response is being recorded. (Conversely, a continually rising base level can move beyond the upper limits of the channel.) Since there is some distortion in the extreme limits of each channel, the polygraph operator attempts to keep each pen moving in the middle range of its channel by changing the resistance level of the GSR bridge unit--in 10K ohm steps--as needed. For example, if an individual whose base resistance is, say, 80K ohms is gradually increasing this resistance until it is over 95K ohms, the operator can adjust for this by turning the control on the bridge unit from a level of 80K ohms to one of 90K ohms, thus bringing the recording pen back near the middle of the channel. This correction was made continuously during recording, as needed. The vertical distance of record for one such 10K ohm correction step is thus a useful measure to determine the amplitude of actual subject responses.

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[16] There was one such large response of around 99K ohms or larger. It was difficult to determine its exact amplitude since it reached extreme pen deflection limits, even with attempts at adjustment. It was given an estimated rating of 99K ohms, a convenient figure for the analyses.

Different GSR instruments will operate in different ways. With this particular unit the middle pen position of the channel corresponded to the subject resistance reading on the GSR bridge unit dial. Base levels were computed from this "middle" position.[17]

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[17] There was one difficulty with this particular instrument which may not exist with other GSR instruments.

In addition to the two measures mentioned--mean base level and mean GSR amplitude--a number of other measures were used. One of these was the number (frequency) of GSRs. It has been recognized that one GSR measure is the number or frequency of non-specific GSRs, that is, the number of small GSR responses which occur in a record in the seeming absence of any specific stimuli (Katkin, 1965; Miller and Shamavonian, 1965). Such a measure may be meaningful in tests in which subjects are asked to respond to specific, discrete stimuli. But when testing a continuous stimulus such as a motion picture, these non-specific responses would be intermingled with responses to stimuli from the film. Since the subject is receiving a continuous barrage of stimuli, it would be difficult to say non-specifics existed at all. For continuous stimuli, an

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A vertical distance on the record which corresponded to a 10K ohm change at a base level of 70K ohms did not correspond to a 10K ohm change at a base level of 200K ohms. (The vertical distance varied inversely with the resistance level.) Also, a vertical distance of record signifying a 10K ohm change at the middle of the recording channel was larger than the vertical distance for the same change occurring near the boundaries of the recording channel (channel extreme distortion). These phenomena made for difficulty in reading the records. However, using the 1K ohm calibration and 10K ohm adjustment steps as criteria, the experimenter could compensate for this variance, and he is confident that errors of measurement are within tolerable limits.

analogous measure, but one which we must regard in large part as response to actual simuli, would be the frequency of GSR responses per unit length on a record. When treatment stimuli are of equal length as in this study, this measure can be simply the total number of GSRs. (For this study a GSR was defined as a response measuring 1,000 ohms or greater.) This number was computed for all individuals, for each half as well as for the total film. These values ranged from 2 GSR responses to 120 GSR responses.

Largest GSR is simply a measure of the largest GSR on a record, here computed by subjects for each half, and for the entire film. These values ranged in resistance units (ohms) from a 1K response to a recorded response of 99K. When these values were changed to conductance units they ranged from 11.59 to .07 micromhos.[18] These values were also computed as adjusted to the base level as which each occurred.

A number of less frequently used measures were also computed. Minimum base level, and maximum base level were recorded for each subject. As measures of variability of base level, range and standard deviation (and variance) were computed.

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[18] Note that these limits do not correspond to amplitude conductance limits since these values were obtained by taking a reciprocal of the resistance largest GSR scores.

Finally, two measures rather rare in the literature were computed. These are the mean square successive difference (MSSD) (also known as the von Neumann statistic or δ^2), and the ratio δ^2/s^2 known as the von Neumann ratio. The former is a measure of variance, while the latter is a form of autocorrelation measure. Use of both these statistics is advocated by Leiderman and Shapiro (1962, 1963, 1964; Shapiro and Leiderman, 1964) as preferred with autonomic measurement of time-ordered data since this features a changing base level. While this author has not found use of these statistics outside the work of its two advocates (in GSR work), they were included here for comparison with other measures.[19]

With all these possible measures, it was necessary to ascertain which were "best" measures, that is, which were most independent measures offering the most complete, yet most parsimonious, picture of the data.

Two studies were found which analyze a number of

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[19] A somewhat similar measure might be what Lazarus, Speisman and Mordkoff (1963) refer to as their standardized successive differences method of intra-individual correlation.

GSR measures. Speisman, Osborn and Lazarus (1961) were testing subject responses to stress. They used two films in their study. The control film, Corn Farming in Iowa, was relatively unexciting, but of some interest. The stress-producing film, entitled Subincision, was an anthropological study of an Australian stone-age tribe vividly portraying a series of surgical operations rather crudely performed, for ritual purposes, on the penis and scrotum of adolescents of the tribe. The investigators recorded both heart rate and skin resistance of subjects viewing each film. GSR measures fell into five main categories: (base) level, variability, lability (i.e., number of GSRs per inch of record), response, and recovery. These were in conductance units. The response measure corresponds to a measure of the largest GSR.[20] Recovery is a measure to determine how far the subject has returned to his initial level by the end of the film. A cluster analysis was performed on the measures within these five main categories. Their results indicate that level and variability appear as independent and meaningful measures, while recovery[21] and response appear less useful. Lability may also be a useful measure.[22]

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[20] It is not clear why these investigators chose the largest GSR of record as their response measure and ignored mean amplitude. Results of factor analysis for this study indicate amplitude and largest GSR are probably separate factors. Amplitude is so established a measure that this omission of theirs is puzzling. It certainly affects the generality of their conclusions.

Jack Block (1962) did a factor analytic study of GSR responses to the film Steps of Age, produced by the Mental Health Film Board. His subjects were 80 college women. He used 22 measures including some taken during a preliminary resting period before the film was shown, and on ranked base level of beginning and middle resting periods, beginning and middle film periods, and so forth. He also used LIV adjusted scores, the number of non-specific GSRs, and variability. He labels his seven resultant factors as: General Resistance Level, Reactivity to the Film, Involvement in the Film, Phlegmatism, Resistance Peak when Uninvolved, Spontaneous GSRs, and Lowest Resistance Reached at any Time.

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[21] A recovery measure is rarely if ever found in recent literature, and the result cited above indicates the justification for this disregard.

[22] This has been a necessary simplification of their findings, presenting only those details relevant to this study. Their clusters were actually more complex, including separate scores on stress and control films, and initial, film and final levels of scores.

With the example of these two studies, this experimenter performed a number of factor analyses on the GSR data. These were done on all 80 observations, and separately on groups MM and FF. They were done with units of resistance, conductance and log conductance.[23] One set of factor analyses with conductance measures used amplitude and largest GSR measures which were not transformed by the covariance (regression) adjustment. Other sets of factor analyses used adjusted values for these two variables. Results indicate the presence of 6 factors (as was expected): base level, variability, number of GSRs, MSSD, mean amplitude and largest GSR. The least reliable factor seemed to be the largest GSR, since when a fewer number of factors were requested it appeared in the variability factor. Amplitude also showed some impermanence. A more detailed discussion of these factor analyses will be given later in this paper.

The tests of significance comparing treatment groups were performed using standard deviation as a measure of variability and mean base level as the measure of base level (thus excluding from analyses such measures as base level range, minimum base level, and maximum base level).

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[23] As previously indicated, log conductance measures did not include amplitude or a measure of the largest GSR and these were not included in the factor analysis.

There are a number of problems relating to interpreting GSR data. One of these is the large amount of individual variation. One can get some indication of this from examining the ranges presented on the major measures used in this study. There is often intra-individual variation. With base level, for example, one individual may remain at approximately the same level throughout the film. Another will climb gradually, perhaps from 60K ohms to 200K ohms. Still a third will vary greatly up and down, up and down. This makes individual, or even small group, comparisons very difficult.

Another problem with individual variation is the fact that some individuals more readily indicate a state of autonomic arousal on one measure than another. So for a single individual, skin conductance may be a less desirable measure of arousal than, say, heart rate. Therefore it would be advantageous, although not always practical, to use a variety of autonomic measures such as GSR, heart rate, EEG, respiration rate, finger pulse volume, eye pupil measurement, and such like. From a profile response gained from many such measures a more accurate indication of level of arousal and response is possible (Malmo, 1958; Lazarus, Speisman and Mordkoff, 1963a). As further indication of this need, it has been noted that there are frequently low inter-individual correlations between these various autonomic measures. (Lazarus, Speisman and Mordkoff suggest the use of intra-individual correlations as being more appropriate.) For many communication researchers such use of a wide variety of psychophysiological measures would be impractical. If only one such measure can be used, it would appear there is a strong case for the GSR because of its widely attested applicability.[24]

Still another difficulty with GSR interpretation is that while the measure indicates a level of activation in the organism, it does not indicate what stimulus produced this level or a particular response. A number of factors can influence subjects' responses to a specific communication. And when dealing with so complex a stimulus as a film, it is very difficult to state precisely what factor of the film may have caused a specific response. Some of these responses may be highly subjective, perhaps based on a personal association.[25] One subject may understand something in the film which another misses. In addition, there may be responses not to the film at all, but to extraneous factors in the experimental situation. It is not impossible that a male might give a strong response simply because the girl seated nearby decided to cross her legs at that moment. In addition, there may be an interaction with the experimental setting itself (Sternbach, 1964) as may have happened in this study as will be discussed later. All of these possible confounding factors should not discount the use of such valuable instruments as autonomic response measures, but they should indicate the need for careful control and interpretation of results, and for attention to recommended statistical procedures of sampling, randomization and sufficient sample sizes.

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[24] Goldstein et al. (1965), using skin resistance, heart rate, finger pulse volume and respiration rate, found that skin conductance was the most sensitive indicator of stress response and of individual difference in stress response. Lazarus, Speisman and Mordkoff (1963b), found that skin conductance appears to correlate best with subjectively reported affective disturbance over time. Heart rate correlated less well, and respiration still more poorly. They mention in another study finding a reasonable degree of agreement between skil conductance and heart rate. A relatively new and promising measure is eye pupil measurement which Hess (1965) found correlated significantly with skin conductance.

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[25] It is possible, for example, that mentally disturbed subjects can have very strong subjective responses to material which has heightened relevance due to their disturbed state. Alexander _et al_. (1961) found that hyperthyroids reacted physiologically and psychologically different from normal controls when viewing a film. Clemens _et al_. (1965) found that more disturbed subjects reacted in an opposite direction from less disturbed subjects upon the second showing of a film.

Still another problem is the difficulty repeating previous experiments. In discussing this, Martin (1961) points out that very few experiments with psychophysiological measures have been replicated, and those which have do not invariably support earlier findings. Among reasons for this she cites the complex (and often highly specific) nature of stimuli used in most experiments and the fact that measurements are often derived in different ways and may be highly specific to a particular set of data.

From the above discussion, it is apparent that the GSR can be a useful instrument of communication research as it serves as a measure of level of activation and hence as an indicator of degree of audience involvement, interest, and "emotional" arousal. While there are a number of difficulties involved in obtaining data from the instrument and in interpreting these data, these difficulties should not preclude its use.

CHAPTER IV

EXPERIMENTAL CONDITIONS

The conditions under which this experiment was conducted are of more than routine research interest. Exigencies of the experiment imposed a requirement on the experimental environment which was not really conducive to collecting data of this type. These experimental environmental factors appear to have interacted with the variables being tested. The experimental conditions and this interaction will be discussed.

Location of the experiment was dictated by the need for a multi-channel polygraph for use with the GSR. Equipment which this experimenter hoped to use at the University of Southern California proved not available. Nor were personnel from the University free to act in a major consulting role. Fortunately the staff at the Veterans Administration hospital at Sepulveda, California, were generous in making their polygraph equipment available for use in the evening. Someone from Biocom Corporation who had been doing some alterations on this equipment built and installed the GSR units and was hired as consultant to monitor the GSR. The hospital is located some 25 miles from the University, which necessitated transporting many volunteer student subjects that distance. Testing was done in the Psychiatric Ward of the hospital. While subjects had no cause to worry, still the atmosphere of the building, the locked doors, and the presence of patients, as well as the fact that it was a Psychiatric Ward unsettled some subjects.

The actual experimental site consisted of two small, rather crowded, rooms. The outer room contained psychophysiological instruments, including the GSR polygraph [illegible] process). The experiment was run in the inner room (15' x 11') where subjects were seated on five chairs located from 6 to 11 feet from the motion picture screen.

The test films were projected on a Bell and Howell Filmosound 302 projector using the magnetic sound head since the treatment films had a striped magnetic sound track. The sound speaker was located just below the screen in front of the subjects. Projected picture size was 1 1/2' x 2'. The door between rooms was located beside the screen and was left open during the testing. Light readings taken with a Gossen Lunasix light meter 4 feet from the screen indicated that there was .11 foot candles of ambient light on the screen from the open door. As the picture was projected, light from the screen was .44 foot candles. With the meter pointed at the door and reading admitted light, it registered .22 foot candles. These seem effective viewing conditions.

When subjects first arrived, they waited in the parking area until the first group were taken into the building. This area was next to a large grassy landscape. Coffee, punch and cookies were served subjects. In the summer evening warmth the waiting experience seemed generally pleasant, although some subjects may have grown impatient if they had to wait long for their group to be taken. Every effort was made to reduce such a feeling.

In much experimental research it is desired to minimize the effects of variable experimenter-subject interaction. Frequently instructions to subjects are written beforehand and read to each group to insure each receives the same material. Often these instructions are recorded to further insure detachment and objectivity. A short sound film had been prepared as an introduction to this study. It featured the experimenter explaining to subjects what the study was (ostensibly) testing, and what was required of them. The film was not used. It had been prepared to gain detachment and objectivity. It was soon apparent that given the conditions of the experiment, this was not what was needed. Preliminary testing at the experimental site indicated that it was more desirable to try to put subjects at ease than to control subject instructions. Therefore, the experimenter followed a simple outline in explaining the experiment to the subjects, and by a friendly manner tried to reduce any tensions they might have due to the environment.

Subjects were first given the two-part questionnaires. They were told that basically this was a simple study designed to obtain their written evaluation of the effectiveness of a film as well as their GSR response which would augment the written evaluation by providing a physiological record of their involvement. They were advised they would not be shocked by the electrodes. While subjects were completing the first page of the questionnaire, electrodes were attached to their non-writing hand. The middle segment of the index and middle fingers were cleansed with alcohol, bentonite paste was put on, then the electrodes were fastened in place with adhesive tape. Subjects were instructed to hold the electrodes still to avoid moving artifacts on the GSR record. Then they were asked to sit quietly and relax while their records were calibrated. When each record was reasonably steady, subjects were frightened by a shout so their latency response factor could be noted. Subjects were then explained this necessity and assured nothing like it would occur again.

Subjects then completed the semantic differentail pre- forms and turned these in to the experimenter.

The experimenter gave a brief introduction to the film, explaining that they might see either a film or a filmograph (which was defined), or a version which contained both. They were again reminded to keep the hand steady which had the electrodes attached. The film began.

Three persons assisted the experimenter with the study. One monitored the GSR, another ran the projector, a third stayed outside with groups waiting. The GSR monitor corrected each subject's record to keep the recording pen near the center of the channel. At each correction point he would mark the new resistance setting of the GSR dial. The experimenter marked each record to indicate the start, half division, and end of the film, and the location of each piece of narration. The projectionist observed subjects viewing the film and noted any particulars of behavior such as restlessness or drowsiness.

When the film was completed, subjects were again asked to remain quiet for a few moments while the calibration was recorded. Subjects were then taken outside where they completed the remainder of the evaluation, and a new group was brought in. The final group of the evening completed the second part of the questionnaire in the testing room.

To what extent did the experimental condition--in particular the presence of the Psychiatric Ward--influence the data? It may be presumed that the entire experience may have increased the subjects' tensions, and hence overall level of arousal. There is some evidence of this in the data, although it is inferential. One such inference may be found in semantic differential response to the film. Although Corral is a quality film, and most subjects indicated they enjoyed it on the attitude questionnaire, their semantic differential scores show a strong negative change toward some concepts related to the film. While some of this reaction may be the result of the film, a part of it may be explained by assuming subjects expected some sort of unusual, shocking film (something like Subincision). The experimental situation could have fed this anticipation. When the film proved harmless, the disappointed anticipations may have produced the negative connotative changes. This is, of course, conjecture. There is some support for it in the fact that a number of subjects commented after the test that they were expecting some sort of shocking film. There is experimental support for the importance of considering subjects' expectancies in Sternbach (1964), who points out that such can alter response.

The GSR records indicate another possible example of environmental interaction. Except for a strong drop near the end of the film, the average base level for all subjects rises steadily from the beginning of the film. Some such rise is typical of GSR records. That this rise is so striking in many records, thus indicating reduced arousal or tension (lowered level of activation), may indicate another source of interaction with the experimental situation. Add to this the fact that the GSR records frequently show that immediately after the film begins there is a definite rise in resistance (reduction of arousal or tension). After the film is ended, there is frequently a strong GSR response, often the strongest response on the record (apart from the latency test). This suggests that the film may have functioned to reduce tensions created by the experimental situation. Once the film begins, subjects might have felt that for the duration of the film they could know nothing unusual would happen to them. When the film ended, they again faced the uncertain--hence their strong response. Thus it is plausible that many subjects considered the film one of the most relaxing moments of their time at the test site. Thus in part the film could actually function to reduce tension or arousal levels. This does not mean that subjects did not react to the film. The GSR records indicate they did this. It does mean that there is indication of response interaction with the experimental situation and that this presents a plausible explanation for some aspects of the data.

The experimental condition, then, was partly the result of necessity. While presenting some hardships, it still permitted effective testing. There is some evidence that conditions interacted with subject response.

CHAPTER V

PRELIMINARY ANALYSIS

This section will include a more detailed presentation of the preliminary analysis of the data. Most of the analyses were performed on the Control Data 1604 computer of the Cornell University Computing Center. Statistical analyses were performed with the Cornell CUSTAT set of statistical programs. These include programs for factor analysis, multiple regression, correlation matrix and factorial analysis of variance.

All measures were quantified. The procedure with the GSR has already been described. Semantic differential pre-, post-, and difference scores were computed on a usual 1 to 7 scoring scheme, where 7 was the score position corresponding to an extreme "positive" position on the scales with respect to the particular factor.[1]

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[1] Those adjectives whose extreme direction was scored 7 were: heavy, pleasant, friendly, relaxed, fast, clean, beautiful, smooth, kind, good, large, valuable, strong and sharp.

Retention was scored as the number of correct answers. Two persons in group MM omitted the last page of their retention test. These missing observations were supplied with values corresponding to typical answers of their treatment group, and of all treatment groups. Certain items were eliminated, as already explained. One item, number seven of the multiple-choice items pertaining to the length of the film, was scored separately.

Attitude items were scored on a 5 point scale. Three subjects, 2 in group MM, 1 in group FM, omitted a page of the attitude questionnaire (those in group MM omitted different pages). Five other subjects omitted individual items. (Two subjects from group FF, and three from group MF omitted items.) Scores for these missing items were taken as the typical score for the particular group. Certain items were treated separately, as was previously indicated. Attitude items were factored individually, as well as summated into total mean attitude score.

All results were transferred to punched computer cards. A FORTRAN program was written to supply needed data. This program (Appendix V) supplied (1) the means and standard deviations of GSR base levels, in resistance, conductance and log conductance units, (2) means of GSR amplitudes in resistance units, (3) sum of time sampled points of the GSR base level at each sampled point, for each group, and the total, and (4) MSSD of GSR base level. In addition to printed output, punched card output was obtained for use in the analysis. Conductance amplitude values were later calculated by hand since the difficulty of measurement precluded using the computer for this purpose.[2]

Semantic Differential Factor Analysis

Semantic differential pre- scores were factor analyzed over all treatment groups, for each concept, and for a total over the four concepts. Three factors were requested to correspond to those discovered by Osgood, Suci and Tannenbaum (1957), although only the evaluative dimension would be used to measure attitude change. Factor analysis was done with the Cornell FACTAN program of their CUSTAT series. This program supplies a correlation matrix, a preliminary principal components solution, and a varimax rotation factor analysis (see Harman, 1960). Communality values were taken as 1.0.

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[2] The reader is again reminded of the problem. One doesn't take the reciprocal of a resistance GSR amplitude value to arrive at the conductance value. Consider a GSR response as the difference between two levels, say, 50K ohms and 40K ohms. The response is then 10K ohms. The straight reciprocal of this, times 10^6, is 100 micromhos. But this is not the micromho conductance of this response. One must first take the reciprocal (times 10^6) of each level, which gives 20 micromhos and 25 micromhos respectively. Their difference, the measure of conductance response, is actually 5 micromhos.

Table 3 (p. 110) presents factor loadings over all 80 observations. Only scales with high factor loadings on the evaluative dimension and low loadings on other dimensions are reported, and only the "positive" adjective of each scale is listed. In each case, the evaluative dimension rated highest, as Osgood predicted. It should be noted from the table that not all scales found to be evaluative correspond to those mentioned in studies in Osgood, Suci and Tannenbaum (1957).

Attitude Factor Analysis

Attitude scores were factor analyzed with FACTAN programs run on all observations, and on MM and FF separately.[3] Seven factors were requested. These results are presented in Tables 4, 5 and 6 (pp. 111-113). The results of all analyses were interpreted as yielding eight factors. (One factor--Instructional narrative--seems

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[3] It is not generally recommended to factor analyze as few as 20 observations. This was done in order to provide a clearer picture of the data.

TABLE 3

SEMANTIC DIFFERENTIAL PRE- EVALUATIVE FACTOR LOADINGS

Scales	RANCH	A FILM	COWBOY	CANADA	Sum over All Concepts
Pleasant	.564	.599	.878		.710
Friendly	.666	.530	.836		.760
Relaxed				.682	
Fast		.609		.687	
Clean			.444		.523
Beautiful	.525		.539		.529
Kind	415		.578	.722	.625
Good	.512		.536	.513	.657
Valuable		.633	.373		
Sharp	.646	.609			
	Variance (%) Accounted For				
	34%	44%	38%	40%	43%

TABLE 4

ATTITUDE FACTOR LOADINGS: ALL OBSERVATIONS (LOADINGS OVER .450 ONLY)

Test Items[a]	Factors[b]						
	I	II	III	IV	V	VI	VII
1						.748	
2						.680	
3						.749	
4			.643				
6							.836
8							.560
9					.857		
10							.668
14	.500					.612	
15		.802					
16	.765						
17				.864			
18				.518			
19	.728						
20	.616						
21	.587						
22			.688				
	Variance (%) Accounted For						
	50%	13%	8%	6%	5%	4%	4%

[a] Items listed are only those finally used in computing the attitude score.

[b] Factors are numbered in the order they appear in each analysis. They do not necessarily conform to final composite factors. Nor does one factor here necessarily conform to factors in other attitude factor analyses.

TABLE 5

ATTITUDE FACTOR LOADINGS: GROUP MM (LOADINGS OVER .450 ONLY)

Test Items[a]	Factors[b]						
	I	II	III	IV	V	VI	VII
1	.719						
2		.473		.541			
3		.605					
4						.804	
6					.801		
8		.807					
9					.739		
10		.615					
14	.687						
15			.903				
16	.825						
17	.460						.486
18							.626
19	.925						
20	.525						
21	.852						
22				.916			
	Variance (%) Accounted For						
	37%	19%	12%	8%	6%	5%	4%

[a] Items listed are only those finally used in computing the attitude score.

[b] Factors are numbered in the order they appear in each analysis. They do not necessarily conform to final composite factors. Nor does one factor here necessarily conform to factors in other factor analyses of attitude measures.

TABLE 6

ATTITUDE FACTOR LOADINGS: GROUP FF (LOADINGS OVER .450 ONLY)

Test Items[a]	Factors[b]						
	I	II	III	IV	V	VI	VII
1				.884			
2		.586		.611			
3				.797			
4			.895				
6		.623			.569		
8					.670		
9			.531				.686
10					.839		
14	.554			.482			
15						.529	
16	.758					.512	
17		.721					
18		.891					
19						.861	
20						.802	
21	.649						
22	.872						
	Variance (%) Accounted For						
	47%	14%	12%	8%	8%	4%	3%

[a] Items listed are only those finally used in computing the attitude score.

[b] Factors are numbered in the order they appear in each analysis. They do not necessarily conform to final composite factors. Nor does one factor here necessarily conform to factors in other factor analyses of attitude measures.

questionable to this investigator, in spite of its appearing as the third factor on the analysis of all observations.) The eight factors (in no particular order) along with the attitude test items which compose them, are:

1. Film music (Item 15)
2. Film narration (Item 22)
3. Amount learned (Item 4)
4. Film appeal (Items 1, 2, 3, and 14)
5. Cowboy in real life (Items 6, 8, 9, and 10)
6. Visual film techniques (Items 16, 19, 20, and 21)
7. Cowboy in the film (Items 17 and 18)
8. Instructional narrative (Items 4 and 22)

GSR Adjustment and Factor Analysis

To adjust for the effect of the partial dependence of GSR amplitude on the base level, as previously described in the discussion of the Law of Initial Values, a regression or covariance adjustment was performed. The adjustment was done on amplitude mean scores and on the largest GSR in resistance and conductance units. Largest GSR score adjustments were also done on both first and second half scores. For comparison, the adjustment regression analysis was also done separately on groups MM and FF.

A multiple regression analysis was performed with the MUREG program of CUSTAT. Regressions were computed on the mean base level for amplitude, and on the actual base level reading where it occurred for the largest GSR. Results of this analysis are given in Table 7 on the following page. The adjusted values were punched on computer cards and used for later analysis.[4] As will be noted from the positive correlation coefficients, data supports the hypothesis of a Law of Initial Values effect operating as proposed by Wilder.

Factor analyses using the Cornell CUSTAT FACTAN program were performed on all observations, and on groups MM and FF. A number of analyses were performed using different units (resistance, conductance and log conductance), with and without MSSD variables, and with and without transformed values for GSR amplitude and largest GSR. Preliminary analysis indicated the number of factors to request. One analysis on conductance values requested one less factor in order to observe which factors would be

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[4] Values used were the regression residual values since these could easily be stored on tape and used in subsequent factor analyses. This does not affect subsequent analysis as the true adjusted score could be obtained by adding a constant--the grand mean--to each residual value.

TABLE 7

REGRESSION ANALYSIS OF GSR AMPLITUDE AND LARGEST GSR

	Beta	Standard Error of Beta	Constant	r	R^2	F Value[a]
All Observations						
GSR Amplitude						
Resistance	.023	.005	1.16	.46	.21	20.7
Conductance	.07	.005	-.43	.84	.71	187.0
Largest GSR						
1st 1/2, R	.06	.02	3.22	.30	.09	7.5
2nd 1/2, R	.18	.03	-3.81	.56	.31	35.0
1st 1/2, C	.15	.02	.26	.53	.28	30.0
2nd 1/2, C	.10	.02	.74	.47	.22	22.0
Group MM						
GSR Amplitude						
Resistance	.04	.01	.56	.66	.44	13.9
Conductance	.006	.001	-.064	.75	.57	23.5
Largest GSR						
1st 1/2, R	.09	.06	4.43	.34	.12	2.4 NS
2nd 1/2, R	.21	.06	-3.6	.65	.41	13.0
1st 1/2, C	.25	.09	-.65	.53	.28	7.1
2nd 1/2, C	.017	.04	2.24	.10	.01	NS[b]
Group FF						
GSR Amplitude						
Resistance	.012	.008	1.68	.32	.10	2.03 NS
Conductance	.06	.001	-.31	.82	.68	40.0
Largest GSR						
1st 1/2, R	.06	.03	2.0	.40	.16	3.47[c]
2nd 1/2, R	.05	.05	4.8	.22	.05	NS[b]
1st 1/2, C	.18	.04	-1.02	.71	.50	17.8
2nd 1/2, C	.21	.05	-.84	.68	.46	15.3

[a] Significant at <.05 unless otherwise indicated.

[b] F ratio less than 1.

[c] $p<.10$.

confounded. Variables analyzed were mean base level, maximum base level, minimum base level, base level range, base level standard deviation, number of GSRs, mean amplitude, largest GSR, MSSD and the von Neumann ratio δ^2/s^2. Mean amplitude and largest GSR were also used as transformed values.

Results of factor analyses done on all observations are shown in Table 8 on the following pages. Analyses done on groups MM and FF are not presented as their findings are generally redundant. Five factors emerge with fair consistency:

1. Base level
2. Base level variability
3. Number (frequency) of GSRs
4. Amplitude
5. Largest GSR

(MSSD variables emerge as a sixth factor in the analyses where they were included. However, since they are little-used variables, they were omitted from the majority of factor analyses.) It should be stressed that these are statistical factors, and it is beyond the scope of this study to attempt to give them psychological or physiological meaning.

TABLE 8

GSR FACTOR ANALYSES FACTOR LOADINGS
ALL OBSERVATIONS
(HIGH LOADINGS ONLY)

Variables	Factors					
	Conductance					
	I	II	III	IV	V	VI
Mean base level	.973	.503				No high loadings
Maximum base level	.987					
Minimum base level	.875					
Base standard dev.		.956				
Base range		.948				
Number of GSRs			.989			
Mean amplitude	.748					
Largest GSR					.496	
MSSD				.792		
δ^2/s^2				.905		
Variance (%) accounted for	59%	19%	12%	6%	2%	1%
	Conductance with Transformed Values					
	I	II	III	IV	V	VI
Mean base level		.976				
Maximum base level		.987				
Minimum base level		.882				
Base standard dev.	.929					
Base range	.920					
Number of GSRs			.989			
Mean amplitude					.853	
Largest GSR	.581					.639
MSSD	.466			.776		
δ^2/s^2				.881		
Variance (%) accounted for	50%	24%	12%	6%	4%	2%

TABLE 8--Continued

Variables	Factors				
	Conductance				
	I	II	III	IV	V
Mean base level	.905				
Maximum base level	.996				
Minimum base level	.886	.450			
Base standard dev.		.968			
Base range		.970			
Number of GSRs			.998		
Mean amplitude	.766	.435			.435
Largest GSR		.689		.601	
Variance (%) accounted for	61%	22%	13%	3%	2%
	Conductance with Transformed Values				
	I	II	III	IV	V
Mean base level		.992			
Maximum base level		.997			
Minimum base level		.899			
Base standard dev.	.913				
Base range	.922				
Number of GSRs			.997		
Mean amplitude	.408			.889	
Largest GSR					.782
Variance (%) accounted for	48%	30%	13%	5%	4%

TABLE 8--Continued

Variables	Factors			
Conductance with Transformed Values (Four Factors Requested)				
	I	II	III	IV
Mean base level		.992		
Maximum base level		.997		
Minimum base level		.898		
Base standard dev.	.933			
Base range	.954			
Number of GSRs			.994	
Mean amplitude				.834
Largest GSR	.748			
Variance (%) accounted for	49%	30%	13%	5%
Log Conductance				
	I	II	III	IV
Mean base level	.968			No high loadings
Maximum base level	.908	.416		
Minimum base level	.974			
Base standard dev.		.982		
Base range		.984		
Number of GSRs			.997	
Variance (%) accounted for	52%	31%	16%	1%

TABLE 8--Continued

Variables	Factors				
	Resistance with Transformed Values				
	I	II	III	IV	V
Mean base level	.463	.881			No high loadings
Maximum base level	.590	.791			
Minimum base level		.976			
Base standard dev.	.830			.464	
Base range	.862				
Number of GSRs			.996		
Mean amplitude				.886	
Largest GSR				.915	
Variance (%) accounted for	52%	29%	13%	4%	2%

A review of all factor analyses indicates that the first and second factors are usually Base Level and Base Level Variability. Although a number of variables load high on these factors, base mean level and base standard deviation are preferred statistical measures. The most consistently pure factor is the Number of GSRs. It always appeared as the third factor. Least reliable are the Amplitude and Largest GSR factors. These variables frequently appear on other factors. Sometimes they combine into one factor. In the conductance analyses, transforming these values resulted in clearer factor differentiation. In the analyses performed on group MM, neither of these variables emerge clearly as factors when not transformed but do when transformed. The analysis of group FF shows a striking change here. With untransformed conductance values, Base Level is the fourth factor (the fifth factor is meaningless, with no high loadings). When transformed, Base Level becomes the first factor. Group FF factor analyses with conductance and resistance values placed Variability as the last factor (accounting for only 1% of the variance). (However, it must be remembered that such analyses are being carried out on only 20 observations.)

Summarizing the findings on GSR measures, optimum procedure seems to be to use transformed amplitude and largest GSR values. These can be considered (somewhat unreliable) factors along with Base Level, Base Level Variability and Number (Frequency) of GSRs. If included, MSSD values constitute another factor.

CHAPTER VI

PRIMARY ANALYSIS

The basic statistical design of this experiment involves a comparison of the four treatment groups to determine if those viewing a motion version of a film respond more strongly on attitude, retention and audience involvement (GSR) measures than those seeing a filmograph version, with two groups of mixed treatments to determine if order effects exist. To compare groups, four types of analyses of variance and one analysis of covariance were used.

The type of analysis most readily suggested with the design used is the analysis of variance of difference scores computed from each half film scores. A difference is:

$$D_{kn}=Y_{kn}-X_{kn}$$

where Y is the individual's score on the second half of the treatment film, and X is his score on the first half. This procedure is similar to an analysis of covariance if beta within is assumed to be equal to 1.0. (See Edwards, 1960, pp. 295-296.) Such comparison, since it depends on both first and second half values, will detect order effects is such exist.

Obviously, this analysis is useful only on those variables for which first and second half scores exist. For semantic differential and attitude variables which do not have scores on each half, as well as for the variables tested by the analysis of variance of difference scores, a second analysis of variance was performed which compared total scores for all four treatment groups.

While the design of this experiment utilized 4 treatment groups, including two mixed groups, there might be some advantage in being able to combine the 80 subjects into just two treatment groups corresponding to the two film treatments. This can be done by combining data from first half scores (it would be inappropriate with second half scores since these probably would not be independent of first half scores). This was done, and a third analysis of variance series of tests performed.

A fourth factorial analysis of variance series was done using treatment groups as one factor and periods (halves) as a second factor. While results might present some problems of interpretation, it would be valuable to see if there were any significant interactions.

Finally, an analysis of covariance series was performed using first half scores as covariates and comparing second half data. This is analogous to analysis which uses a GSR resting base level as a covariate to adjust treatment scores; while not strictly correspondent to such an analysis, there should be a similar result, especially with groups MM and FF.

Analyses of variance were performed using the Factorial Analysis of Variance (FANOV) program of Cornell's CUSTAT system. The analysis of covariance program was from the library of programs at the Cornell Computer Center. An F level where $p<.10$ was chosen for reportable results as with the nature of the variables it was felt that there was a greater risk of missing a significant result should one exist (type II error). Where significant results were obtained, Newman-Keuls tests (Winer, 1962, p. 80) were done on individual means.[1]

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[1] Newman-Keuls tables indicate values at the .05 level. Since .10 was the reporting level used in this study some of these F values were not significant on the Newman-Keuls, but direction of difference was at least indicated.

Results of the analyses generally indicate that there are no significant differences between treatment groups with the exception of differences on attitude measures where group FF is significantly lower than other groups. Selected significant results will be presented.

The analysis of variance of difference measures was performed on the following variables:

Retention
Number of GSRs
GSR base level (R,C,LC)
GSR base standard dev. (R,C,LC)
GSR amplitude (R,C)
Largest GSR, adjusted (R,C)
MSSD (R,C,LC)

Only one of the analyses reached the significance level used (see Table 9 on the following page). It is likely that this is a chance result and of no significance to this study. The equivocal direction of difference would support this.

Analyses of variance comparing all four groups were performed on the following variables:

Retention
Attitude factors
Semantic differential difference factors
Age
Number of GSRs
GSR base level (R,C,LC)
GSR base standard dev. (R,C,LC)

TABLE 9

ANALYSIS OF VARIANCE OF DIFFERENCE SCORES
SIGNIFICANT RESULTS

Variable	SS	df	MS	F	Prob.	Newman-Keuls
GSR base level (Resistance)						
Treatments	2498	3	832	2.43	<.10	NS, but indicates FM>FF,MF
Error	22155	76	291			

Adj. GSR amplitude (R,C)
Adj. Largest GSR (R,C)
MSSD (R,C,LC)
δ^2/s^2 (R,C,LC)

Results are reported in Table 10 on the following pages. Of primary importance is the indication that group FF definitely had a poorer opinion of their filmograph than did groups seeing other versions. The other findings must be regarded skeptically as possibly chance results since no meaningful consistent pattern emerges.

An analysis of variance on combined M and F treatments on just the first half scores used the following variables:

Retention
GSR base level (R,C,LC)
GSR base standard dev. (R,C,LC)
Number of GSRs
Amplitude (C)
Adj. Largest GSR (R,C)
MSSD (R,C,LC)

Only one of these, amplitude (C), was significant (see Table 11 on page 132).

A factorial analysis of variance was used primarily to detect the effect of interaction of treatments with periods (halves). (This would serve as an indication of additivity or nonadditivity.) Such an analysis must be regarded judiciously because of the questionable use of

TABLE 10

ANALYSIS OF VARIANCE: MM/FF/MF/FM SIGNIFICANT RESULTS

Variable	SS	MS	F[a]	Prob.	Newman-Keuls
Attitude, Total					
Treatments	6.69	2.23	7.8	<.01	MM,MF,FM>FF
Error	21.99	.29			
Attitude, Music					
Treatments	8.65	2.88	7.6	<.01	MM>FF
Error	28.90	.38			
Attitude, Amt. learned					
Treatments	10.94	3.65	4.93	<.01	MM,MF,FM>FF
Error	56.45	.74			
Attitude, Film appeal					
Treatments	18.60	6.20	10.12	<.01	MM,MF,FM>FF
Error	42.26	.56			
Attitude, Cowboy in real life					
Treatments	3.04	1.01	2.34	<.10	NS, indicates MM>FF
Error	32.97	.43			
Attitude, Visual film					
Treatments	9.36	3.19	4.45	<.01	MM,MF,FM>FF
Error	53.03	.698			

TABLE 10--Continued

Variable	SS	MS	F[a]	Prob.	Newman-Keuls
Age					
Treatments	654.94	218.31	2.43	<.10	NS, indicates FM>MF,MM
Error	6815.55	89.7			
Sem. Diff. Cowboy					
Treatments	3.53	1.18	2.33	<.10	FM>MM,FF,MF
Error	38.37	.51			
Sem. Diff. Canada					
Treatments	4.19	1.40	4.07	<.01	FM>MF,FF
Error	26.18	.343			
GSR Std. Dev. (R)					
Treatments	845.96	281.99	2.3	<.10	NS, indicates MM,FM>MF
Error	9294.62	122.3			
Retention					
Treatments	90.55	30.18	2.26	<.10	NS, indicates MF>FF
Error	1009.40	13.6			

[a] Df.=3,76 for all tests.

TABLE 11

ANALYSIS OF VARIANCE, 1ST HALF ONLY, M/F
SIGNIFICANT RESULTS

Variable	SS	df	MS	F	Prob.	Result
Amplitude (C)						
Treatments	2.43	1	2.43	3.7	<.10	M>F
Error	51.26	78	.66			

periods (halves) as a factor.[2] Variables tested were:

Retention
GSR base level (R,C,LC)
GSR base standard dev. (R,C,LC)
Number of GSRs
Amplitude (R,C)
Adj. Largest GSR (R,C)
MSSD (R,C,LC)

Most of the significant results indicate that one half of the film was different from the other. This is of little interest to this study, but the greater number of GSRs and larger GSR amplitude in the second half indicates that this period of the film was more involving, as is to be expected in a work which builds to a climactic moment. (That the base level measures do not indicate this but show the opposite reflects the gradual overall lessening of tension as has been discussed.) Results of these analyses are presented in Table 12 on the following pages.

The interaction effect noted with GSR base level (R) is, in the view of this researcher, a chance effect. Two treatment effects were significant--retention and amplitude (R)--the latter lending partial support to the hypotheses, although it must be viewed judiciously.

The analysis of covariance tests were performed on

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[2] Winer, 1962, p. 315, gives an example of a study where periods was used as a factor.

TABLE 12

FACTORIAL ANALYSIS OF VARIANCE TREATMENTS X PERIODS (HALVES) SIGNIFICANT RESULTS

Variable	SS	df	MS	F	Prob.	Results
Retention						
Treatments	45.28	3	15.09	2.27	<.10	MF>FF
Error	504.7	76	6.64			
GSR base level (R)						
Periods	2322.9	1	2322.9	15.9	<.01	2d 1/2 > 1st 1/2
Treatments X Periods	1249.07	3	416.36	2.85	<.05	FM>MF
Error	11077.8	76	145.8			
GSR base level (C)						
Periods	12.35	1	12.35	4.4	<.05	1st 1/2 > 2d 1/2
Error	211.7	76	2.8			
GSR base level (LC)						
Periods	.17	1	.17	12.4	<.01	1st 1/2 > 2d 1/2
Error	1.03	76	.014			
GSR std. dev. (R)						
Periods	188.88	1	188.88	5.13	<.05	1st 1/2 > 2d 1/2
Error	2262.69	76	29.77			

TABLE 12--Continued

Variable	SS	df	MS	F	Prob.	Results
GSR std. dev. (C)						
Periods	5.61	1	5.61	10.4	<.01	1st 1/2 > 2d 1/2
Error	41.22	76	.54			
GSR std. dev. (LC)						
Periods	.028	1	.028	9.3	<.01	1st 1/2 > 2d 1/2
Error	.24	76	.003			
Number of GSRs						
Periods	540.23	1	540.23	23.0	<.01	1st 1/2< 2d 1/2
Error	1720.2	76	22.6			
GSR ampl. (R)						
Treatments	65.08	3	21.7	2.93	<.05	MM>MF,FF FM>MF
Error	564.7	76	7.4			
Periods	24.27	1	24.27	10.1	<.01	2d 1/2 > 1st 1/2
Error	182.56	76	2.4			
GSR MSSD (R)						
Periods	14539.	1	14539.	3.58	<.10	2d 1/2 > 1st 1/2
Error	308343.	76	4057.			

the following variables:

Retention
GSR base level (R,C,LC)
GSR base standard dev. (R,C,LC)
Number of GSRs
GSR amplitude (R,C)
Adj. largest GSR (R,C)
GSR MSSD (R,C,LC)

Only one of these reached significance at the .10 level as is shown in Table 13 on the following page.

What may we conclude from the above analyses? First it should be emphasized that these tests were planned, not performed post hoc. The different types of analyses were undertaken to obtain a more complete picture of the data. The results, taken together, show there is little consistency even on the few significant results obtained. GSR base level (R) was significant, but only at the .10 level. Amplitude (C) was significant, but only when comparing first half data. These results could be the result of change. All other significant results, with the exception of findings on the attitude measures, must be considered doubtful. This does not support major hypothesis 1 that film motion of itself can create audience emotional involvement, but it does support major hypothesis 3 that motion is not a significant factor in audience information

TABLE 13

ANALYSIS OF COVARIANCE
SIGNIFICANT RESULTS

Variable	SS	df	MS	F	Prob.	Newman-Keuls
GSR base level (R)						
Treatments	201.69	3	673.31	2.49	<.10	NS, indicates FM>FF
Error	2028.32	75	270.44			

	MM	FF	MF	FM
Adjusted means	91.76	82.47	86.29	95.64

retention. The attitude score results definitely indicate that group FF had less esteem for the filmograph, supporting major hypothesis 2. By extension, there is no support for subsidiary hypothesis 5 that there is a positive relationship between audience involvement and attitude response; however, there is support for subsidiary hypothesis 6 that there are no significant relationships between those measures and retention.

Before dismissing the unsupported hypotheses, this investigator feels there is other evidence in the data which should be examined. The tests reported above do not tell the complete picture.

An examination of the treatment means in Table 14 (pp. 139-140) reveals that with certain important GSR variables there is indication that group MM is more responsive than group FF. This is observed in the amplitude and largest GSR measures (it is denied by the number of GSRs--a curious phenomenon especially in light of this measure being used alone in some studies--and base level measures are equivocal, as has been discussed). This trend suggests that subsequent experimentation might produce more positive results.

TABLE 14

SELECTED TREATMENT MEANS[a]

Variable	MM	FF	MF	FM	Total Mean	Total Std. Dev.
Attitude:						
Total	3.75	3.01	3.66	3.55	3.49	.60
Music	3.05	2.30	3.15	2.80	2.83	.69
Narr.	3.60	3.65	3.80	3.85	3.73	.90
Amt. learned	3.65	2.80	3.75	3.45	3.41	.92
Appeal	3.39	2.19	3.30	3.18	3.01	.88
Cowboy in real life	3.98	3.43	3.71	3.74	3.71	.68
Visual film	4.13	3.26	4.06	3.90	3.84	.89
Cowboy in film	3.78	3.45	3.65	3.50	3.60	.73
Inst. narr.	3.35	2.55	3.45	3.13	3.12	.69
Sem. Diff. diff.:						
Total	-.12	-.30	-.20	-.013	-.159	.58
RANCH	-.28	-.26	-.017	-.13	-.17	.80
A FILM	-.13	-.32	-.28	-.21	-.29	.89
COWBOY	-.043	-.05	-.007	.45	.008	.73
CANADA	.05	-.21	-.33	.26	.056	.62
Age	22.5	25.5	21.9	29.1	24.76	9.72
Retention	16.55	15.55	18.45	17.35	16.98	3.73

TABLE 14--Continued

Variable	MM	FF	MF	FM	Total Mean	Total Std. Dev.
GSR:						
Base lvl.						
(R)	88.94K	86.06K	68.80K	97.12K	85.23K	42.68K
(C)	14.44	14.44	18.75	13.40	15.26	8.66
(LC)	2.55	2.56	2.79	2.47	2.59	.50
Std. dev.						
(R)	13.08K	8.0K	5.14K	12.39K	9.65K	11.33K
(C)	1.81	1.16	1.38	1.43	1.44	1.21
(LC)	.14	.088	.075	.12	.106	.10
Number GSRs	32.65	35.20	28.85	26.60	30.83	19.65
Ampl. (R)	4.03K	2.68K	2.33K	3.56K	3.15K	2.18K
Ampl. (C)	.81	.58	.96	.56	.73	.78
Adj. (R)	.79K	-.49K	-.44K	.13K	0.0	1.94K[b]
Adj. (C)	.14	-.084	-.035	-.023	0.0	.42[b]
Largest						
GSR (C)	3.70	2.20	2.99	2.21	2.77	2.51
Adj. (R)	7.42K	1.22K	1.79K	3.41K	3.46K	11.63K[b]
Adj. (C)	1.63	.24	.43	.35	.66	2.13[b]
MSSD (R)	62.06K	29.28K	14.05K	50.86K	39.06K	71.82K
MSSD (C)	1.31	.99	.95	1.09	1.08	1.74
MSSD (LC)	.007	.004	.002	.006	.005	.007
δ^2/s^2 (R)	.46K	.57K	.56K	.46K	.51K	.42K
δ^2/s^2 (C)	.64	.60	.51	.51	.57	.64
δ^2/s^2 (LC)	.043	.035	.027	.034	.035	.03

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[a] Largest GSR (R) is not included as it was never separately calculated outside of an internal computer program.

[b] Mean values are residuals and not true mean values.

This study also contains additional evidence of treatment differences. These will be considered.

There is reason to assume that blanket tests of GSR data means are inappropriate with continuous stimuli. Lazarus and Alfert (1964) and Speisman _et al_. (1964) discuss the merits of using point-to-point analysis in addition to mean base level. While their arguments are primarily appropriate to their design, they can be extended to apply here. It is conceivable that certain scenes would be more exciting, more involving, in the filmograph version than in the motion version. Yet this could still support a theory that motion produces audience involvement response. A rapid series of still pictures produce the effect of apparent motion.[3] This may have happened with the filmograph version, at certain spots. Thus it may be that different parts of each film treatment version were differentially involving. Such difference would not be detected by comparing mean values, since these would average out. This experimental design featured four instead of two treatment groups as an attempt to counteract this effect. In spite of this, there may be differentiated effects which were not detected. Such effects, if detected, could support the theory of motion producing response, although they would not support the idea that generalized motion, as opposed to non-motion, is so affective.

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[3] The reader is reminded that at sound film projection of 24 frames per second, 3 feet of film takes 5 seconds of screen time. One foot of film takes 1 2/3 seconds. The filmograph version frequently features series of rapid still pictures. For example, in the first half of the film there is a series of 10 pictures ranging from just over 1 foot length to just over 3 foot length, with 6 of these shots less than 2 feet long. Out of 45 shots at the middle of the film, 4 are less than 1 foot, 19 are less than 2 feet, and 10 are less than 3 feet. One 14 shot sequence here consists entirely of shots under 3 foot lenghts. The phenomenon of shot-to-shot apparent motion is strongly possible.

The graphs on the following pages present a summary of GSR base level records. Figure 1 presents the summated base levels for the four treatment groups, separately. Figure 2 is a composite graph of all records. Figure 3 combines the two like groups to get graphs of motion and still. The graphs are presented over the 22 sampled points of the GSR record. As these are in resistance units, a drop in the graph represents involvement or arousal. The sharp drop at sampling point 19--Figure 3 shows this attributable to motion treatment groups--corresponds to a climax when the cowboy mounts and rides the horse. The response would seem to indicate that the excitement of this scene, and perhaps the motion of the running horse,

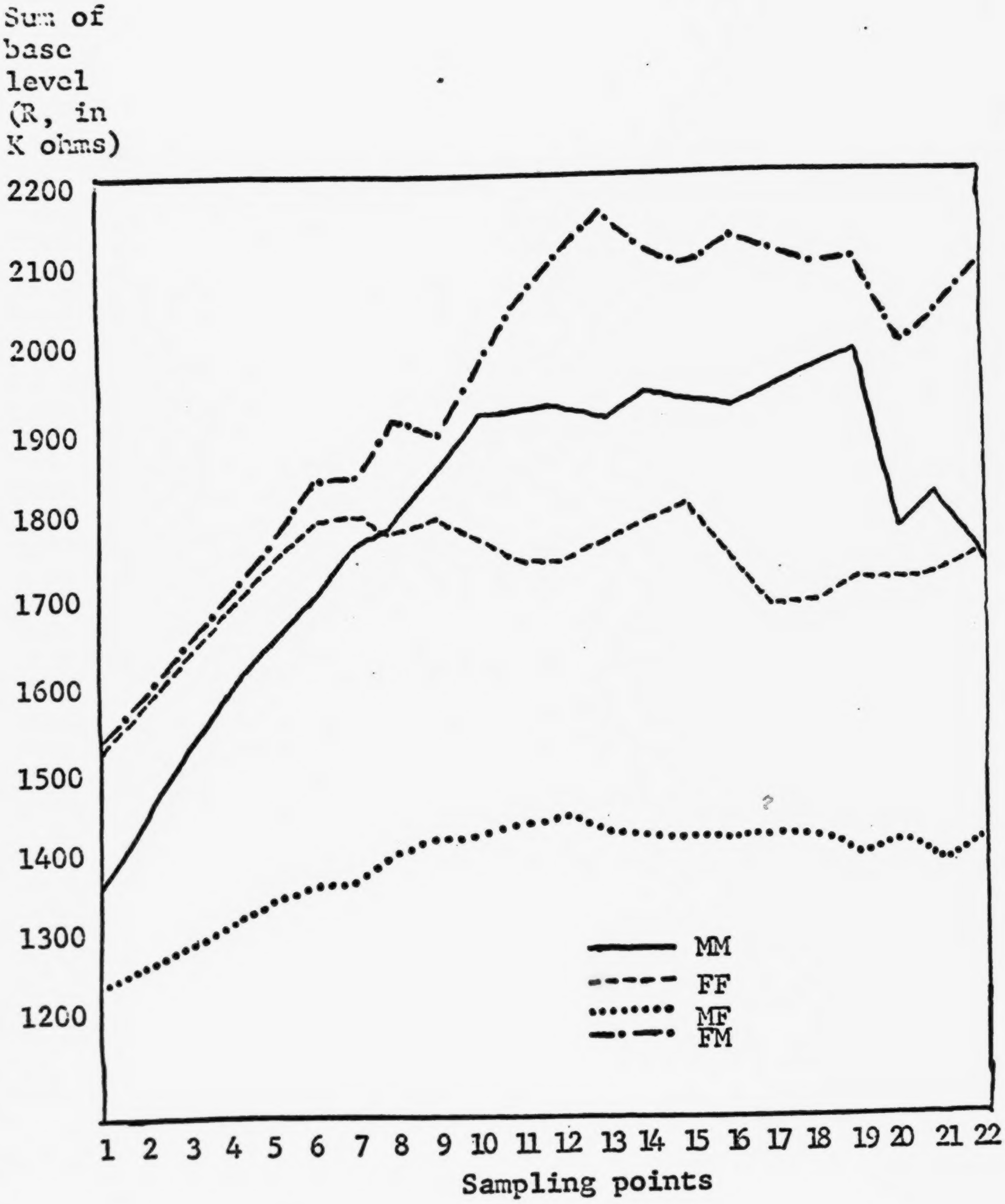

Figure 1. Summated GSR Base Levels
Treatment Groups

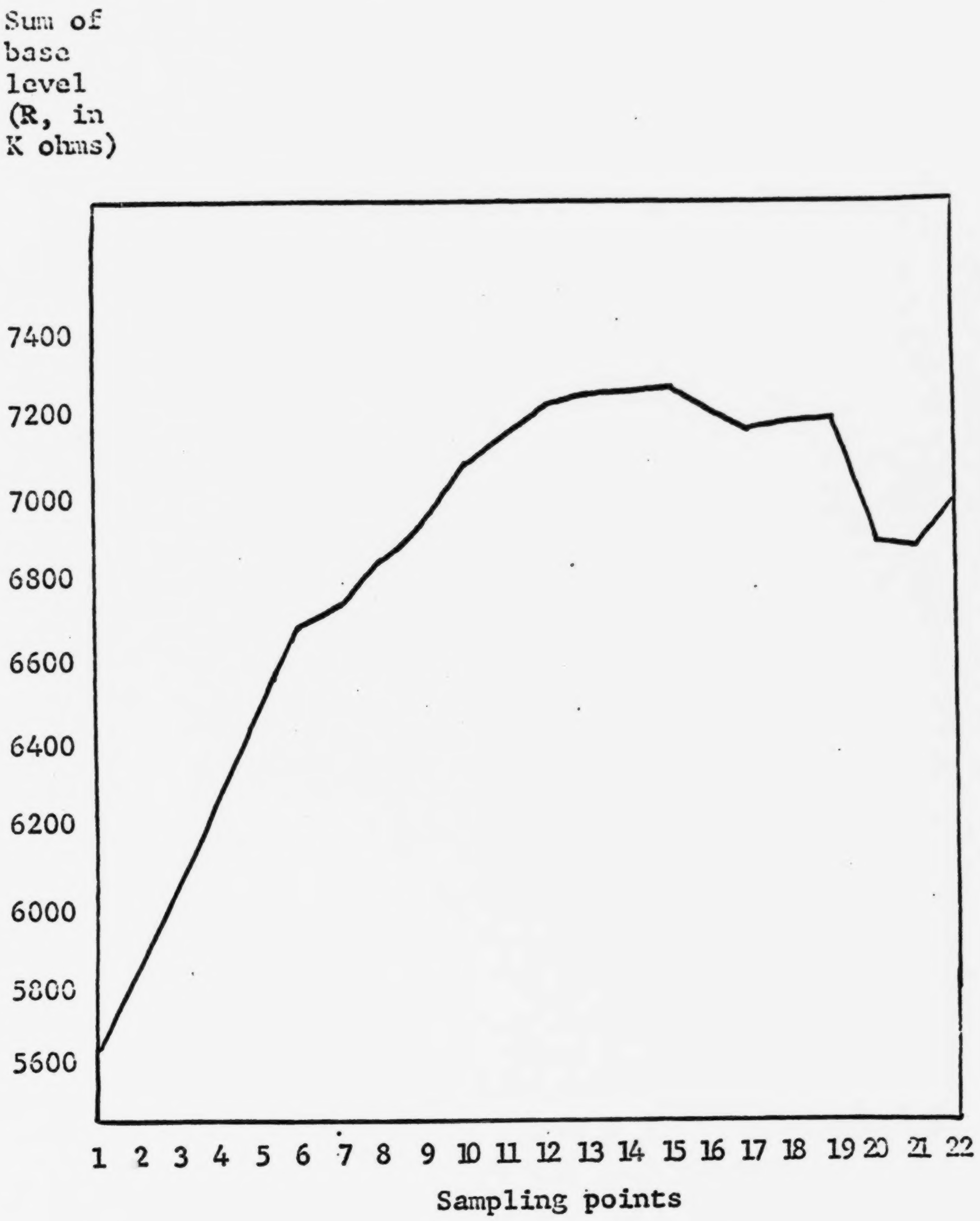

Figure 2. Summated GSR Base Levels
Composite Values

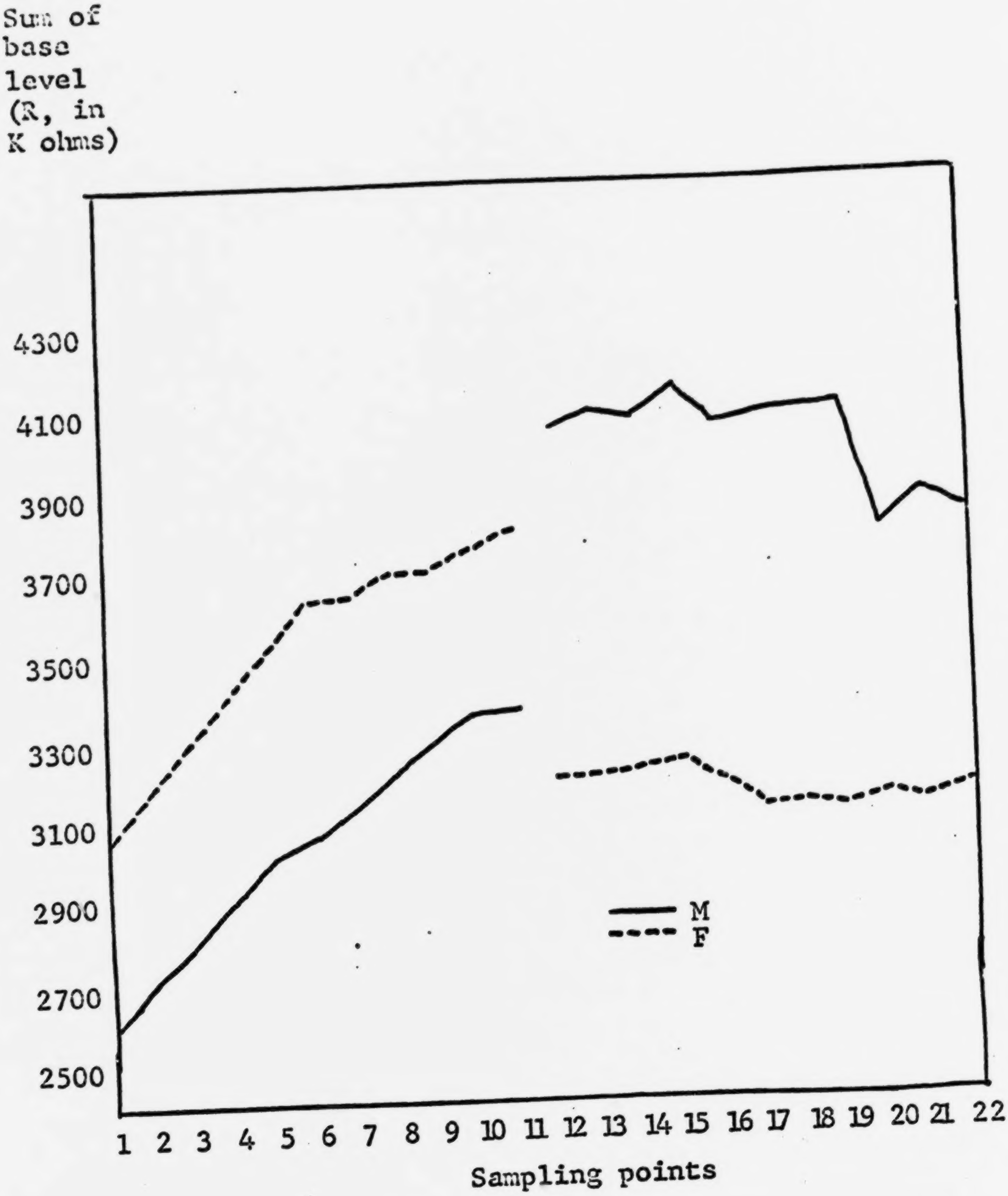

Figure 3. Summated GSR Base Levels
Composite M/F Values

contributed to the excitement of response for those seeing the motion version.

In view of this, three point-to-point comparisons were made at selected points in the GSR records. The first was around the 7th sampling point where there was a slight resistance base level drop for the filmograph groups. The second comparison was just before the halfway mark of the film to cover the exciting action of lassoing the horse. The final point was around the 20th sampling point to catch the mounting and riding scenes. The first and third comparisons covered a period of just over a minute of film time each, the second a period of just under a minute. These tests were on combined treatment groups comparing motion and filmograph. Comparisons were made with the number of GSRs in these periods, and the mean amplitude (R) of the GSRs. These were analyzed by individual t-tests. None of the tests of the number of GSRs were significant. Only one of the amplitude tests was significant. This was the test made on values for the point occurring in the second half of the film and corresponding to the cowboy mounting and riding the horse. Mean amplitude scores are 3.63K ohms for the motion group and 1.93K ohms for the filmograph group. With 78 df, $\underline{t}$=2.34, which is significant with $p<.01$. This verifies what is apparent from visual inspection of the summated base level graphs. Since this occurs during a scene characterized by fast--somewhat rhythmical--motion, it lends some support to hypothesis 1 that film motion may create an audience arousal response.

Additional Analysis

A number of other tests were done in addition to those reported above. These investigated other aspects of the data. Often they support the hypotheses. In some cases they deal with other matters. These will be discussed.

Related to the question of an exciting, climactic moment is the item in the attitude questionnaire which asked the subject to name the most exciting moment in the film. If subjects thought both treatment film versions equally exciting, we would expect the most exciting moment to be named equally in both versions. Eliminating 12 answers which did not refer to a definite moment in the film but used general descriptive terms such as "scenery" or "photography," and setting aside the 6 answers which said there was no exciting moment (significantly, 5 of these were from the FF group), we find 45 subjects placed the most exciting moment in the motion version, while only 17 placed it in the filmograph version. A $\underline{X}^2$ test showed the difference was highly significant with $\underline{X}^2=12.6$. This is another indication that subjects found the motion version more exciting.

In answer to question 7 of the multiple-choice retention items, group FF thought that the film was longer than did other groups, $\underline{X}^2=9.58$, 3 df, $p<.05$. The data is presented in Table 15 on the following page. This can be interpreted as another indication of interest.

Item 12 of the attitude evaluation measures asked subjects to estimate grade level for which the film would have most appeal. Only group FF felt the film would appeal more to a junior high school audience than to a higher grade level. However, a chi-square test was not significant ($\underline{X}^2=2.83$, 3 df).

A chi square test was performed on the number of GSRs equal to or greater than 5K ohms. It was reasoned that smaller GSRs might be non-specific GSRs and represent some normal non-stimulus-oriented responses, while larger GSRs might be specific stimulus-produced responses. The number of GSRs greater than or equal to 5K ohms was tabulated for all groups. Results were MM 134, FF 128, MF 72 and FM 96.

TABLE 15

RESPONSES TO QUESTION ON LENGTH OF FILM

Response	Groups			
	MM	FF	MF	FM
Correct length, or less	10	3	12	7
Longer length	10	17	8	13

Because of the small number in the mixed versions, data were combined into total number of GSRs greater than or equal to 5K ohms for motion and for filmograph subjects. Means of these two groups were M 241 and F 189. When tested, $\underline{X}^2=6.07$, 1 df, $p<.05$, indicating motion produced a significantly greater number of these larger GSRs. However, it must be pointed out that the real differences here occurred with the mixed groups (MF and FM) and not with groups MM and FF. Also, there is a question of the independence of these measures from the mixed groups which casts a shadow over these results.

Since it was decided to retain the original music track on the film, there was a question whether or not some of the obtained GSR response would be to the music and not to the film. There was not time to thoroughly test this question, but 6 subjects were tested to get some indication of the effect. Three subjects saw the film motion version without soundtrack, then afterwards simply heard the music track. The other three heard the music track first, then saw the film without soundtrack. Only GSR recordings were taken. While little can be concluded from so small a sample, an examination of their GSR records indicates that base level profiles for each subject are surprisingly similar for music and film. There is indication from two subjects that they responded more to the film--one of these subjects saw the film first, the other saw it second. Three subjects gave essentially flat responses. Three gave some definite responses, especially on the last part of the film featuring the riding sequence. One subject who saw the music first gave strong responses during the second half of the music track. These were roughly paralleled later when he saw the silent film. This gives indication that at least some subjects can respond strongly to a music track alone without first seeing the film. This interaction of film and music track might be further investigated.

Another series of analyses was performed on the semantic differential data to note the extent and direction of the change between pre- and post- tests.[4] Quite to this investigator's surprise, the film generally affected negative changes on this measure. When using evaluative scales from Osgood, Suci and Tannenbaum (1957), before the decision to factor analyze this data,the changes were even more negative. Since it was difficult to believe that these negative changes with respect to concepts related to the film were solely the result of the film, it was thought these changes might be due to the experimental situation or because the treatment films with added narrative soundtrack destroyed the effect of the original film. Additional testing was done with twenty student volunteers--14 male and 6 female--at Cornell University. In a relatively non-threatening location, they were shown the original film (without the added narration track). Findings here confirmed the original findings--subjects generally made negative connotative evaluative changes. These results are reported in Table 16 on the following page. Probability values were computed by a Wilcoxon signed-ranks test on scales summed over subjects (Diamond, 1959; Siegel, 1956). Dealing with such small numbers of observations, even this test has difficulty detecting significant differences, and it may be that the probabilities would be even lower than those recorded if more scales had appeared on each factor. The concept CANADA cannot be tested at all since with four scales it falls below values of the table of values for the Wilcoxon test. Only one significant positive change was reported--for COWBOY for group FM. In addition, a $\underline{X}^2$ test was performed to compare the total number of negative and

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[4] It will be recalled that these tests did not significantly differentiate motion and still groups.

TABLE 16

SEMANTIC DIFFERENTIAL EVALUATIVE DIFFERENCE RESULTS SUMMED OVER SUBJECTS

Concept	Group				
	MM	FF	MF	FM	Cornell
RANCH	-40[a]	-31[a]	-2	-16	-32
A FILM	-16	-37[a]	-33[a]	-28	-33[a]
COWBOY	-6	-7	-1	63[b]	21
CANADA	4[c]	-17[c]	-26[c]	21[c]	-28[c]

[a] Significant at the p=.10 level, Wilcoxon signed-ranks test.

[b] Significant at the p=.02 level, Wilcoxon signed-ranks test.

[c] Since factor analysis identified only four evaluative scales for CANADA, this amount is smaller than the smallest value on the tables of Wilcoxon test values.

positive responses over all factors. Corrected $\underline{X}^2=3.5$, 1 df, $p<.10$, indicating a significantly greater number of negative responses. Whether subject expectation is a major factor in interpreting these data cannot, at this time, be known. The data indicate that the film, in both motion and filmograph versions, affected greater negative attitude change to most concepts tested.

Correlational Analysis

Another aspect of this study was to examine the relationships of the variables. Correlations were run on all variables in the study. Most of these are of little interest. Some significant correlations undoubtedly are spurious or chance results due to the large number of correlations computed. Those few which are of interest will be reported. All correlations were computed as part of the Cornell CUSTAT factor analysis (FACTAN) analyses, or as part of the MUREG (multiple regression) analysis which has provision for providing only correlations. Correlations were computed for all observations, and for groups MM and FF. For all 80 observations, a one-sided test shows the following significant values for $\underline{r}$: .183 at the .05 level, .217 at the .025 level and .256 at the .01 level.

For the 20 observations of groups MM or FF, these values are: .36 at the .05 level, .42 at the .025 level and .49 at the .01 level (Edwards, 1960, p. 362). Findings shall be discussed on all observations.

To what extent did semantic differential difference scores correlate with GSR data? There is some correlation, but it is not large. For example, adjusted GSR amplitude (C) correlated .20 with semantic differential difference Total, and .21 with A FILM. Base level (C) correlated .18 with COWBOY, and MSSD (C) correlated .23 with the Total difference. Other correlations were not significant or appeared to be chance results. Such scattered correlations do not lend much support to a relationship between GSR data and attitude change.

The same results are observed with correlations of attitude measures and GSR data. Only one such correlation reaches .20.

There is no evidence of a relationship between GSR and attitude measures, therefore hypothesis 5 is not supported.

Retention correlated .31 with attitude: film appeal and .21 with Total mean attitude. It correlated .25 with Total semantic differential difference (but this was primarily accounted for by relationships to scores on RANCH and COWBOY with which it correlated .19 each). So there is some positive relationship between retention and attitude change as measured on the semantic differential, especially with respect to two scales (RANCH and COWBOY), and indication of a positive relationship between retention and attitude measured on a Likert-type scale, especially with respect to the subject's evaluation of his own involvement and interest. However, these correlations are not high. This tends to suggest refutation of part of hypothesis 6 which says there is no significant relationship between attitude and retention measures. It is possible that this reflects an attitude response partly based on the subject's reaction to how he felt he did on the retention test which he took before taking the attitude measure; however, this would not account for the response on the semantic differential.

Retention correlated only .18 with GSR base level (C), and lower than this with other GSR measures. This lends support to the other part of hypothesis 6.

Retention and attitude: amount learned correlated only .11, indicating that subjects here were not good judges of how much they learned. (There is always the possibility that "learned" refers to much more than what was covered in the retention questionnaire and that subjects had this in mind in their answer. But this is not likely since subjects had just completed the retention test.)

There is some relationship between Total attitude scores and Total semantic differential pre- score (r=.41) and post- score (r=.45). Attitude: cowboy in real life and semantic differential post-test for COWBOY showed r=.55. Attitude: cowboy as a film character and semantic differential post- COWBOY showed r=.54. Other correlations between attitude measures and semantic differential measures are also significant although they do not have so directly a meaningful interpretation as these do. These findings indicate, as might be expected, that there is a relationship between the Likert-type attitude questionnaire items and the semantic differential evaluative scale. If such correlations are not higher it may be because the semantic differential is a more general measure of concept connotation than were the specific attitude questions asked in this study.

Correlations between semantic differential pre- and post- scores showed that these varied from .33 (A FILM) to .60 (COWBOY). Total difference correlation score was .57.

Correlations of semantic differential pre- scores with difference scores ranged from -.39 to -.57, the Total correlation was -.10. These negative correlations indicate that those with higher initial scores changed most negatively, or least positively, and conversely.

It is interesting to note possible relationships among GSR measures, although large correlations should not be expected after the factor analysis isolated these factors. Significant results (done only on conductance measures) include adjusted amplitude and MSSD (.59) and adjusted largest GSR with MSSD (.71), with adjusted amplitude (.63), and with unadjusted amplitude (.45). Base level correlated .25 with its standard deviation. Base level standard deviation correlated .64 with adjusted amplitude and .72 with adjusted largest GSR, which is expected since larger responses would be accompanied by greater fluctuations in the base level. Some of these are probably chance results.

Correlations done separately on groups MM and FF are not important except to note that the correlation between retention and attitude: amount learned was -.56 in the MM group and .28 in the FF group. Why were the motion group such poor estimators of how much they learned?

This investigator cannot speculate an answer, but that seems to have been the case.

The correlation analysis indicates that there is much to be learned about the relationships of audience autonomic measures (skin conductance) and other measures of audience film evaluation.

CHAPTER VII

SUMMARY AND CONCLUSIONS

This chapter will present a summary of the study and its results. It will discuss these results, pointing out some limitations of the study, and possibilities for further research.

Summary

This study was designed to test whether film motion--a salient formal property of the motion pictures--can, of itself, produce audience response. Response was measured by the galvanic skin response (GSR), by an information retention test, and by two attitude measures--the semantic differential pre- and post- evaluative measures of attitude change, and a Likert-type attitude questionnaire. This study was especially interested in the GSR as a tool for communication and artistic measurement.

There were four treatment groups of 20 subjects each. (Subjects were primarily college students and adults.) One group saw a normal motion picture. A second group saw a filmograph (still pictures) made from the film. The third and fourth groups saw mixed treatments--one-half motion pictures, one-half filmograph, and conversely, to test for possible order effects.

The film used was Corral, a 12 minute black-and-white film produced by the National Film Board of Canada in 1954. Primary testing was done at the Veterans Administration Hospital, Sepulveda, California, in 1965.

Data were analyzed on the Cornell University Control Data 1604 computer, using primarily the Cornell CUSTAT statistical programs. GSR and attitude scores were given preliminary factor analyses to identify independent factors. Data were analyzed by four different analyses of variance series, and one analysis of covariance series. Additional tests were done, and correlations were computed. Analyses of variance were performed on (1) the difference scores between the first and second film half scores of each treatment group, (2) scores of all treatment groups, (3) first half scores of the groups combined into two groups of 40 subjects each, and (4) scores of all treatment groups, treating periods (halves) as an additional factor in a factorial analysis of variance. An analysis of covariance was done on the second half scores of suitable data, using the first half scores as the covariate.

Results of the above tests indicate only that the motion group scored significantly higher on attitude ratings of the film (excluding the semantic differential attitude change measures) than did the filmograph group. Few other measures were significant, and these were more than likely chance results to be expected from the number of tests performed. It was concluded from these tests that a generalized statement of the positive effects of motion on a film audience is true only with respect to their attitude about the film and its content. However, trends on important GSR measures indicate that motion groups did score higher, a difference which might be significantly detected by additional testing.

There was other evidence for at least partial acceptance of significant results with respect to GSR and a specific sequence in the film. A sequence near the end of the film (featuring a galloping horse and corresponding to the film climax) produced significantly higher GSR amplitude scores for the motion group than for the filmograph group. This suggests that a generalized approach to this question is less effective than an approach testing phenomena within the context of the total film impact, including content and form interaction.

Correlational analysis indicated no significant relationships between GSR and attitude measures, or between GSR and retention measures. There was some evidence of correlation between retention and attitude measures.

There is indication that despite some complexity with the measure, the GSR is a useful tool for measuring audience response to communication or (film) art. This and other autonomic measures should be increasingly used in communication research.

Conclusions may be summarized in terms of the hypotheses of the study as follows:

1. Hypothesis 1, that film motion as a salient formal property of films is capable, of itself, of creating audience emotional involvement response, was generally not supported, although partial support was realized in some particular analyses, and for a specific film sequence which featured a great deal of motion at a climactic moment.

2. Hypothesis 2, that film motion as a salient formal property of films is capable of creating a positive audience attitude response, was generally supported.
3. Hypothesis 3, that film motion as a salient formal property of films is not a significant factor in audience information retention, was supported.
4. Hypothesis 4, that the galvanic skin response (GSR) is a useful instrument for evaluating film audience emotional involvement response, was, in this investigator's view, supported.
5. Hypothesis 5,that there is a significant positive relationship between film audience involvement response and attitude response, was not supported.
6. Hypothesis 6, that there is no significant relationship between film audience emotional involvement and attitude responses, and information retention, was given mixed support. It was supported since there was no GSR and retention relationship. It was questioned since there was some attitude response and retention relationship.

Discussion

This study was an exploratory approach to a relatively untested area. Therefore it was decided to isolate for investigation a basic property (film motion) and test for broad, generalized results. That is, the basic comparison would be motion with non-motion. Then, if the basic premise with respect to the importance of motion in audience involvement response was empirically established, additional results concerning interactions with attitude and retention measures could be examined.[1] That the importance of motion to audience response received such scant support from the experimental results suggests that the basic approach was unsatisfactory. Some limitations of the approach of this study will be discussed.

One limitation has already been mentioned. While this study defined motion as the obvious motion within the shot, as opposed to a still photograph, there are other forms of film motion which--if there is actual audience emotional involvement response to movement--could be confounding factors. One of these is the apparent motion produced by the rapid sequencing of short shots one after the other.[2] It has already been suggested that this might have produced some response in groups viewing the filmograph. That these responses would be enough to balance responses to motion within the shot must be questioned, however.

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[1] This explains why hypothesis 6 was partially supported, and partially denied. The hypothesis was framed with the assumption that hypothesis 1 would be confirmed.

There is another problem which this investigator feels was inherent in the experimental approach. It may well be that motion is, of itself, capable of producing audience emotional involvement response. This is so expressed in the literature reviewed, and given some empirical support in the Humphrey study cited. The Humphrey study isolated motion from most other properties of a film. This study did not want to so use abstract motion. It tried to keep the realistic film-viewing context, yet isolate motion for analysis. Here is where the problem may lie. While motion may be a response-producing stimulus, it is not the only response-producing stimulus. The other qualities in the film may have worked to produce audience response to the extent that the differential effects of motion were less noticeable.

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[2] Another form of motion might be the implied motion present in a dynamically composed still photograph. But this is probably not such an empathic response-producing factor.

Motion, then, may be an aesthetic property salient in film which is capable of being used in that medium to produce audience emotional involvement response, but this response must be considered along with all other response-producing properties of a film. Motion may be functioning within a nexus of many response-producing properties. Their inter-relationships may be extremely complex. Therefore we might conclude that as there is some evidence in this study to support the hypothesis concerning the response-producing effects of motion, we may assume that motion has some such property; as there is evidence in this study not supporting this hypothesis, we may surmise that the effects of motion are not of themselves dominant in producing audience response in a realistic film context.

That motion should be studied in context with other film properties suggests that perhaps the distinction should not have been between motion and non-motion, but between controlled motion used distinctly for its effect and the same scene not so constructed. What is so effective in film (and art) may be rhythm--controlled motion--and not just motion *per se*. Certainly there would be a case for saying that the differentiating effects achieved for the sequence of the galloping horse near the end of the film would support a hypothesis based on a rhythmic movement. But even here, can we ignore the relationship of this sequence to the entire film? Probably we cannot. This question was examined with some additional later testing, however problems preparing the equipment for use has limited the number of additional subjects tested to just a few. The results are not really statistically reportable. It does indicate, however, that when this exciting sequence is shown apart from the film, in a different context, it does not produce the strong GSR response it did for the motion treatment group. (This is from 8 subjects tested.) But if context is so important, why didn't the filmograph group have a similar strong response here? This can only suggest the complexity of the relationships involved, and the need for further research.

One example of unusual audience response to be inferred from the data concerns the large GSR response which frequently occurred just before the end title of the film. (Not to be confused with the large response which occurred just after the end of the film and which has already been discussed.) There were 38 of these responses, from all treatment groups. These responses occurred over an inactive and seemingly unexciting scene--the cowboy calming the horse shown in a very long shot. Why the response? One explanation is that there is a response which comes at the culmination of dramatic structure. It may be that the dénouement of a well-constructed dramatic piece produces a response of fulfillment (much as Aristotle speaks of a purging in a tragedy). Some further investigation was also attempted on this point, but at this writing only a few subjects were able to be tested. (For the reader's interest, of four additional persons tested with Corral, two gave such a response.)

Another limitation of the experimental design should be noted. The use of two mixed groups to test order effects would have been useful had there been the expected significant results so that order effects would have importance. As it turned out, two groups of 40 subjects each could have been used as a more preferred design.

Two relationships (or lack of relationships) among the variables are surprising to this investigator. It would be expected that GSR responses might follow the like-dislike results of the significantly different attitude score ratings. Generally, they did not. The correlation between retention and attitude measures was surprising, even though it is small. There is little evidence in the literature to suggest it. There is need for further research on the relationships of such audience response measures.

One of the most useful conclusions of this study comes from the use of the GSR and its feasibility for further research. This investigator is convinced that psychophysiological measures open new fields for the researcher in communication or experimental aesthetics. There is no question that in spite of problems of analysis and interpretation, such measures, and especially the GSR, are extremely useful tools.

Recommendations

Although this study was primarily basic exploratory

Although this study was primarily basic exploratory

research, it may suggest some practical applications.

For the film-maker, there is the implication that formal properties--in particular, motion--in spite of their complex relationships, can be very useful as a supplementary effect in the scene. However, it is too facile to say that motion can augment or reinforce the effect of scenes, therefore use calm motion in calm scenes, active motion in active scenes, etc. The type of motion, and its involvement with subject matter and other film elements, must be considered. Aspects of these relationships are discussed in the theoretical literature previously cited. One should also not overlook the possibility of using formal qualities to enhance a scene by playing against it, that is, to suggest a mood different from that in the scene. This technique is frequently used by film music composers, where they often feel it is more effective than always underscoring the scene with music (which they refer to as "mickey-mousing"). It may be that the tensions so produced heighten the effect of the scene. Such possibilities, as well as other film devices used instinctively by the best film-makers, are possible areas for further empirical investigation.

One possible phenomenon suggested by this study

One possible phenomenon suggested by this study is the spectre of future film-makers poring over polygraph records the way they now study scripts, storyboards (sketches of scenes of the films), and audience rating cards. It is possible. It is now being done with commercials and some television shows. As we understand more of what psychophysiological measures tell us about audience preferences, we may increasingly use them to evaluate our films and television programs, to make improvements in these, and to pre-test their effects on an audience.

For the educator, the findings of this study underscore findings of previous studies that indicate no significant differences in informational teaching ability between a motion picture and a filmograph. (However, the mean scores do indicate a tendency for the film to be considered more effective here.) The correlation studies suggest that there is a relationship between retention and attitude ratings, even though it is small. And since attitude ratings significantly favored the motion picture, there is indirect indication of its superiority. As a whole, however, these results are equivocal.

It is hoped that the methodology of this study will point the way for further investigation on the important question of audience involvement factors and how they

tant question of audience involvement films more effective,

can be used to make instructional films more effective. This study can make no major recommendations in this regard concerning the use of motion. There are many other audience involvement factors, however, and these can be subjects for later research.

A strong recommendation from this study is for researchers to continue to investigate audience response factors with psychophysiological measures.

Suggestions for Further Research

A number of suggestions for further research have been already made in this paper. These can be generalized into areas for future research.

It has already been strongly recommended that communication and experimental aesthetics researchers make use of psychophysiological measures. The GSR is an excellent measure with the advantages of convenience, a large background of material in the literature, and the fact that in studies where it is used with a number of other autonomic measures it is often the preferred measure. (It has been pointed out, though, that a number of such measures are preferred to a single measure, if these may be conveniently used.)[3]

Among the questions which can be answered, and

Among the questions which can be answered, and

partly through the use of autonomic measures, with additional research are what aspects of communication we are measuring with which measures, and how these combine into the universe of audience responses.

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[3] An increasingly prominent measure is eye pupil measurement. The references cited earlier mention studies which have been done with the pupilograph on art paintings, greeting cards, silverware patterns, and television commercials. This researcher is presently doing eye pupil studies with films, correlating this with GSR recordings. It is too early to discuss results, but it appears to be a useful measure.

More research is needed in the area of experimental aesthetics and of art as a form of communication, and of the artistic response. There is need for study of empathy and the importance of the kinesthetic in aesthetic response.

There is need for further study of film properties, and how they interact in different situations to produce audience response. So much of what is now just theory or "common sense" in the art of the film could be investigated to obtain empirical answers.

Finally, it can be mentioned that film and television lend themselves to the type of research done here. The experimenter has greater control (through film techniques and editing) over the response-producing properties of the medium than he has using many other stimuli. So in

of the medium than he has using many other stimuli. So in

addition to investigations on film, the medium can be used, as the literature survey indicated, to test other phenomena. Then the more we learn about the nature of film and the filmic experience, the better we will be able to refine film for use as a research tool.

It is hoped that this study will stimulate others to continue investigations along these lines.

APPENDIXES

APPENDIX I

DESCRIPTION OF FILM CORRAL

APPENDIX I

DESCRIPTION OF FILM CORRAL

After titles, the film opens with a printed legend superimposed over scenes of the cowboy riding in the distance. The legend reads:

> The saddling of a half broken horse is a common task of the cowboy. It requires years of experience and a knowledge of handling horses that is part of a tradition centuries old.

From the top of a bluff the cowboy watches a herd of horses. He rides down to the herd. With the help of his dog, he drives the animals until they enter the corral. The cowboy dismounts and sets in place the logs which form the corral fence. Removing his saddle, he releases his mount to graze.

The cowboy enters the corral, loosens his lasso, and moves into the pack. The horses move around nervously. The cowboy sees the horse he wants and isolates it. Swinging the lasso around his head, he chases the animal now this way, now that. Then he throws, and catches his horse.

(This marks the halfway point of the film.)

Now begins a contest between man and horse. Both dig their feet into the corral dust. The cowboy wraps the rope around the snubbing post for additional leverage. Holding the horse, he inches along the taut rope until his hand can touch the animal's nose. The horse jumps! Again the cowboy holds him. Again he inches his hand along the rope toward the horse. He touches the animal. He strokes. He pats. The horse is quiet. Moving close, the cowboy loops the rope into a halter. Leading the horse to the corral railing, he places bridle, blanket, then saddle on the animal. He then leads the horse outside the corral, letting the other horses go free as well. He starts to mount. The horse twirls. He's on. And the horse takes off on a wild run across the countryside. They ride through the prairie grass. They splash through a small stream. Finally, the horse has run out. The cowboy reins him to a stop. He leans over and rubs the neck of the subdued animal. Then man and horse turn and ride off into the distance.

APPENDIX II

NARRATION

APPENDIX II

NARRATION

This appendix presents the narration track added to the film. Footage indicates the approximate spot at which the narration began, measured from the number 3 in a square of the academy leader on the film. The scene is a very brief notation of the scene over which the narration begins.

Footage	Scene	Narration
17	Legend	The saddling of a half broken horse is a common task of the cowboy. It requires years of experience and a knowledge of handling horses that is part of a tradition centuries old.
56	Close up, cowboy	Southwestern Alberta remains one of the few areas given to

Footage	Scene	Narration
		ranching and the cowboy. It is a vast grazing region of 64 thousand square miles, or 35 million acres of forage. One reason it has remained ranch land is because the low annual precipitation of only 9 to 12 inches produces a moisture deficiency which makes the land poor for farming, but good as forage due to the natural drought-resisting grasses which grow there. These natural grasses include blue grama, spear grass, western wheat grass, and blue grass.
96	Horses, rider	Canadian ranches, unlike those in America, will not own all their grazing land. They will lease most of it from the provincial government.

Footage	Scene	Narration
108	Entering corral	In the horse pack there is an animal who is familiar with the corral. He is known as the Lead Horse. When the pack is driven, he will move to the corral, and the other horses will follow him.
159	Lasso unwound	The rope is a vital part of a cowboy's gear. It can be made of cotton, grass, rawhide, but most are made of manila, as is this one. It will be frequently called a lariat, from the Mexican La Reata, or a lasso. But a cowboy never calls it anything except his rope. Inside the corral the cowboy doesn't usually swing the rope over his head as it frightens the animals making them more

Footage	Scene	Narration
		difficult to catch.
218	Post	The corral center post about which the cowboy wraps the rope is known as a snubbing post.
238	Horse jumping away from cowboy's hand	Scenes like this can be observed at any of the 500 large ranches in Canada.
258	Rubbing horse's nose	Like petting a dog, rubbing the horse's muzzle calms it and gives it confidence.
287	Hackamore put on horse	The cowboy places a hackamore on the horse. The hackamore is like a halter with reins, and is easier on the horse than a bridle and bit.
316	Saddling horse	The horse's reaction is a natural one considering that's a 35 pound saddle being put on his back.

Footage	Scene	Narration
320	Leading horse from corral	To lead the horse from the corral, the cowboy uses a short rein, and turns his back on the animal. With a long rein, the horse would fight it as he fought the rope. And you would find it very difficult trying to lead the horse if you faced him.
342	Mounting horse	A completely broken horse may be worth five times that of one not completely broken.
365	Horse running	There was a slight increase in the demand for horses just after World War II. Since that time, Canada has exported 50,000 horses to Europe and about 200,000 horses to the United States. But the market is declining. Fifty years ago there were 2 million horses in Canada. Today it is estimated this number has

Footage	Scene	Narration
		decreased to under 750,000.
396	Horse controlled	Horse training is rapidly becoming a lost art. In all of North America, there are probably only about 10,000 working cowboys like the one we have seen. It is unfortunate that this traditional figure is so rare in our modern world.

APPENDIX III

FREEZE-FRAME FOR FILMOGRAPH

APPENDIX III

FREEZE-FRAME FOR FILMOGRAPH

This appendix will list the frame which was frozen for each scene of the filmograph, and the length it appeared in the filmograph, plus a rough capsule description of what is on the screen at this frame. Footage is counted beginning at the number 3 in a square of the academy leader of the film.

Freeze Frame (Feet + Frames)	Length of Freeze-Frame (Feet + Frames)	Rough Capsule Description
2 -- 10	5 -- 0	Title
8 -- 10	4 -- 30	Credits
13 -- 0	4 -- 0	Cowboy
17 -- 0	8 -- 8	Legend
29 -- 32	6 -- 14	LS Cowboy
32 -- 12	3 -- 8	MS Cowboy

Freeze Frame (Feet + Frames)	Length of Freeze-Frame (Feet + Frames)	Rough Capsule Description
39 -- 2	6 -- 0	MS Cowboy
41 -- 0	2 -- 23	Horses
44 -- 0	2 -- 17	Horses
45 -- 29	2 -- 28	Cowboy
48 -- 13	5 -- 4	Riding
52 -- 22	3 -- 9	Riding
56 -- 20	1 -- 9	CU
58 -- 31	2 -- 14	LS Horse
63 -- 15	4 -- 28	Horse
66 -- 38	4 -- 22	Cowboy riding
69 -- 16	3 -- 24	Horse
76 -- 29	7 -- 32	Cowboy in
83 -- 17	4 -- 28	Cowboy in
90 -- 4	7 -- 24	Horses
93 -- 24	2 -- 2	Legs
94 -- 32	1 -- 4	Rider
96 -- 22	3 -- 22	Horses, rider
101 -- 26	4 -- 22	Horses, rider
106 -- 20	4 -- 9	Horses
109 -- 16	10 -- 9	Horses enter corral

Freeze Frame (Feet + Frames)	Length of Freeze-Frame (Feet + Frames)	Rough Capsule Description
121 -- 23	4 -- 4	Horses enter corral
124 -- 14	2 -- 34	Horse
126 -- 15	4 -- 10	Cowboy dismounting
129 -- 25	1 -- 33	Fence
132 -- 10	1 -- 10	Horse in dust
132 -- 13	1 -- 34	CU fence
134 -- 26	1 -- 31	Horse looks
136 -- 6	1 -- 35	Fence
139 -- 15	3 -- 14	Horses
143 -- 32	3 -- 7	Saddle
145 -- 1	1 -- 34	Horses
147 -- 29	3 -- 15	Bridle off
149 -- 21	2 -- 19	Bridle off
157 -- 37	6 -- 5	Bridle off, mount leaves
159 -- 3	3 -- 35	Lasso
167 -- 21	6 -- 33	Lasso
169 -- 37	1 -- 22	Cowboy
170 -- 20	1 -- 14	Horse

Freeze Frame (Feet + Frames)	Length of Freeze-Frame (Feet + Frames)	Rough Capsule Description
171 -- 35	1 -- 19	Lasso
176 -- 3	4 -- 26	Swinging lasso
178 -- 12	1 -- 21	Horses
179 -- 17	3 -- 21	Lassoing
184 -- 20	1 -- 31	Horses, lassoing
185 -- 37	4 -- 28	Horses, lassoing
190 -- 10	1 -- 10	Lassoing
192 -- 24	5 -- 31	Lassoing
197 -- 24	1 -- 9	Lassoing
197 -- 35	0 -- 29	Lassoing
198 -- 14	1 -- 10	Lassoing

This marks the end of the first half of the film.

200 -- 1	1 -- 29	Feet
201 -- 33	2 -- 4	Hoofs
205 -- 4	2 -- 0	Tying off on post
208 -- 9	3 -- 30	Holding rope
214 -- 34	8 -- 15	Holding rope, post
218 -- 37	1 -- 23	Horses
219 -- 16	2 -- 33	Holding

Freeze Frame (Feet + Frames)	Length of Freeze-Frame (Feet + Frames)	Rough Capsule Description
223 -- 8	2 -- 2	CU post
224 -- 22	2 -- 11	Hoofs
226 -- 18	2 -- 15	Feet
228 -- 39	0 -- 30	Post
231 -- 25	2 -- 37	Cowboy
232 -- 21	1 -- 10	Horse's head
235 -- 9	2 -- 17	Cowboy, horse
236 -- 18	1 -- 12	Cowboy, horse
237 -- 20	0 -- 22	Cowboy
239 -- 28	2 -- 24	Horse, hand
240 -- 18	0 -- 32	Jump
241 -- 27	1 -- 27	Jumping
244 -- 6	4 -- 0	Cowboy
247 -- 14	6 -- 23	Hand, rub, jump
254 -- 38	1 -- 20	Horse, cowboy
258 -- 0	6 -- 0	Rub nose
263 -- 10	8 -- 39	Rub nose
271 -- 7	6 -- 15	Halter on
282 -- 22	8 -- 34	Leading horse

Freeze Frame (Feet + Frames)	Length of Freeze-Frame (Feet + Frames)	Rough Capsule Description
286 -- 4	6 -- 16	Bridle on
291 -- 24	9 -- 37	Bridle on
304 -- 35	5 -- 33	Blanket on
307 -- 34	6 -- 26	Saddle on
317 -- 12	6 -- 6	Saddle, turn
321 -- 24	5 -- 6	Cinch saddle
326 -- 2	2 -- 25	LS horses
336 -- 24	9 -- 28	Walking out
337 -- 37	1 -- 29	Horses out
340 -- 22	4 -- 26	Mounting
346 -- 34	5 -- 0	Mounting
350 -- 14	4 -- 12	Mounting, on
353 -- 22	7 -- 36	Riding
362 -- 30	5 -- 24	Riding
368 -- 12	2 -- 16	Hoofs
377 -- 18	11 -- 13	Riding
383 -- 30	3 -- 19	Riding
385 -- 29	2 -- 0	Riding
387 -- 19	2 -- 17	Riding in water

Freeze Frame (Feet + Frames)	Length of Freeze-Frame (Feet + Frames)	Rough Capsule Description
389 -- 10	1 -- 5	Out of water
394 -- 26	5 -- 20	Control horse
396 -- 6	2 -- 35	Control horse
400 -- 8	10 -- 13	Walking horse
410 -- 0	3 -- 30	End title

APPENDIX IV

QUESTIONNAIRE

PLEASE FILL OUT THE FOLLOWING BRIEF QUESTIONNAIRE.

ALL YOUR RESPONSES TO THE RESEARCH PROJECT ARE CONFIDENTIAL.

WE ASK FOR YOUR NAME ONLY TO HELP US COLLATE THE MATERIAL.

Name:____________________________________

Sex: (Male-Female) ____________________________

Age:_____________________________________

School, if a student:__________________________

Grade level, if a student:_______________________

Major department, if a student:____________________

The following questions pertain to material in the film and will help our analysis.

Have you travelled extensively in Western Canada?__________

Are you particularly knowledgeable about Canadian ranch life?__________

Are you particularly knowledgeable about any of the following subjects:

Ranch life________________________

Horse training____________________

Horseback riding__________________

Cowboys___________________________

DO NOT BEGIN WORK UNTIL YOU
ARE TOLD TO DO SO.

SEMANTIC SURVEY OF MEANING

This survey will help us measure the meanings of concepts which relate to this study or to the film or filmograph you will see. In taking this test, please make your judgments on the basis of what these things mean to you. On each page you will find a different concept to be judged and beneath it a set of scales. You are to rate the concept on each of these scales in order.

Here is how you are to use these scales:

If you feel that the concept at the top of the page is very closely related to one end of the scale, you should place your check mark as follows:

fair__X__:____:____:____:____:____:____unfair

or

unfair____:____:____:____:____:____:__X__fair

If you feel that the concept is quite closely related to one or the other end of the scale (but not extremely), you should place your check mark as follows:

strong____:__X__:____:____:____:____:____weak

or

weak____:____:____:____:____:__X__:____strong

If the concept seems only slightly related to one side as opposed to the other side (but is not really neutral), then you should check as follows:

active____:____:__X__:____:____:____:____passive

or

passive____:____:____:____:__X__:____:____active

The direction toward which you check, of course, depends upon which of the two ends of the scale seem most characteristic of the thing you're judging.

If you consider the concept to be neutral on the scale, both sides of the scale equally associated with the concept, or if the scale is completely irrelevant, unrelated to the concept, then you should place your check mark in the middle space:

safe____:____:____:_X__:____:____:____dangerous

IMPORTANT

(1) Place your mark in the middle of spaces, not on the boundaries:

X
____:____:____:_X__ ____:____:____
this not this

(2) Be sure you check every scale for every concept--do not omit any.

(3) Never put more than one check mark on a single scale.

Do not look back and forth through the items. Do not try to remember how you checked similar items in the test. Make each item a separate and independent judgment. Work at a fairly good speed. Do not worry or puzzle over individual items. It is your first impressions, the immediate "feelings" about the items, that we want. On the other hand, please do not be careless, because we want your true impressions.

RANCH

____

1. Light ____:____:____:____:____:____:____Heavy
2. Pleasant ____:____:____:____:____:____:____Unpleasant
3. Friendly ____:____:____:____:____:____:____Unfriendly
4. Relaxed ____:____:____:____:____:____:____Tense
5. Slow ____:____:____:____:____:____:____Fast
6. Dirty ____:____:____:____:____:____:____Clean
7. Ugly ____:____:____:____:____:____:____Beautiful
8. Smooth ____:____:____:____:____:____:____Rough
9. Cruel ____:____:____:____:____:____:____Kind
10. Good ____:____:____:____:____:____:____Bad
11. Heavy ____:____:____:____:____:____:____Light
12. Large ____:____:____:____:____:____:____Small
13. Worthless____:____:____:____:____:____:____Valuable
14. Strong ____:____:____:____:____:____:____Weak
15. Sharp ____:____:____:____:____:____:____Dull

(Three additional pages of the semantic differential followed the one on the previous page, and these were headed, respectively, A FILM, COWBOY, and CANADA. This completed the first part of the questionnaire which was completed by the subject before he saw the film.)

THE PAGES FOLLOWING CONTAIN QUESTIONS TO BE ANSWERED AFTER SEEING THE FILM. SO DO NOT PROCEED FURTHER.

SIGN YOUR NAME BELOW, TURN IN YOUR SEMANTIC DIFFERENTIAL SHEETS, AND WAIT UNTIL THE FILM IS SHOWN.

Name:______________________________________

(To identify second part of written evaluation.)

SEMANTIC SURVEY OF MEANING

We are asking you to again make out a semantic survey of meaning like the one you did before the film. Please evaluate each concept as you feel it should be evaluated, do not try to remember how you marked it before the film.

For your convenience, the set of instructions is again provided. After reading them over, if that is necessary, you should go ahead.
Then continue right on through the other parts of the questionnaire.

(The instructions for the semantic differential, and the four semantic differential sheets were inserted here.)

RETENTION

This test will help us determine the informative ability of the film. The questions are deliberately chosen to be difficult. Do not be discouraged if you cannot recall an answer. Put down what you feel is the most correct answer. Answer every question. Give only one answer per question. Follow the instructions for each part of the test.

Answer each question in order; do not go back and change an answer.

Place the letter standing for the best answer in the blank provided.

EXAMPLE:

A cocker spaniel is a __B__

A. Cat
B. Dog
C. Horse
D. Bird

1. Which of the following grasses was not mentioned as growing naturally in the ranch area____________________

   A. Western Wheat grass
   B. Blue grass
   C. Spear grass
   D. Bunch grass
   E. Blue grama

2. The rope used by the cowboy was made of________________

   A. Rawhide
   B. Cotton
   C. Manila
   D. Grass

BE SURE YOU HAVE ANSWERED EVERY QUESTION ON THIS PAGE.

Turn the page.

3. The location of the film was________________________

   A. Southwestern Alberta
   B. Southern British Columbia
   C. Western Saskatchewan
   D. None of these

4. The film estimates that there are only about__________ cowboys like the one we have seen in all of North America.

   A. 5,000
   B. 10,000
   C. 15,000
   D. 1,000

5. There are______large ranches in Canada, according to the film.

   A. 300
   B. 500
   C. 750
   D. 1,200

6. What did the film say about horse training today______

   A. It is increasing in popularity.
   B. It is becoming a lost art.
   C. After a decline, it is again on the upsurge.

7. The length of the film was approximately______________

   A. 15 minutes
   B. 9 minutes
   C. 12 minutes
   D. 18 minutes

BE SURE YOU HAVE ANSWERED EVERY QUESTION ON THIS PAGE.

Turn the page.

8. The film speaks of the horse the cowboy saddled as being__________

   A. Broken
   B. Unbroken
   C. Half-broken
   D. Wild

9. According to the film, Canada's largest market for horses has been__________

   A. The United States
   B. Europe
   C. Australia
   D. South America

10. Since World War II, Canada has exported about_________ horses to Europe.

    A. 200,000
    B. 50,000
    C. 150,000
    D. 100,000

11. The post in the center of the corral about which the cowboy wraps the rope is known as a___________________

    A. Corral post
    B. Roping post
    C. Snubbing post
    D. Breaking post

12. In the region in which the film was located, the film stated there are__________square miles of grazing land.

    A. 64,000
    B. 58,000
    C. 35,000
    D. 24,000

BE SURE YOU HAVE ANSWERED EVERY QUESTION ON THIS PAGE.

Turn the page.

13. The weight of the cowboy's saddle was________________

    A. 20 lbs.
    B. 35 lbs.
    C. 25 lbs.
    D. 45 lbs.

14. The cowboy's term for the rope he used to catch the horse is__________

    A. La Reata
    B. Lariat
    C. Rope
    D. Lasso

15. According to the film, 50 years ago there were________ horses in Canada.

    A. 2 million
    B. 500,000
    C. 1 million
    D. 1 1/2 million

16. The film said the corral was made of_________________

    A. Cedar
    B. Walnut
    C. Pine
    D. The film didn't say

17. The market for horses is_____________________________

    A. Declining
    B. Unchanged
    C. Increasing
    D. The film didn't say

BE SURE YOU HAVE ANSWERED EVERY QUESTION ON THIS PAGE.

Turn the page.

18. To lead the horse, the cowboy used a________________

    A. Halter
    B. Bridle and bit
    C. Hackamore
    D. None of these

19. One characteristic of the above is that it is________

    A. Harder on the horse
    B. Easier on the horse
    C. Neither harder nor easier on the horse than other devices

20. According to the film, a completely broken horse is worth_________as much as one not completely broken.

    A. Three times
    B. Five times
    C. Twice
    D. The film didn't mention this

21. One reason given by the film for the fact that this area has remained ranch land is because_____________

    A. It is too rugged for farming
    B. The rocky soil resists cultivation
    C. It is too moisture deficient for farming
    D. It is too cold for successful farming

22. The film said the cowboy rubbed the horse's muzzle to_________

    A. Show it who was master
    B. Calm it and give it confidence
    C. Let it get used to the smell of human skin

BE SURE YOU HAVE ANSWERED EVERY QUESTION ON THIS PAGE.

Turn the page.

Please answer the following questions with a short answer. Answer every question even if you have to guess; if you cannot even make a guess, then write "Don't know."
Keep your answer to just a few words.

1. What did the cowboy do after he had closed the gate when all the horses were inside the corral?

2. What was one reason given in the film why the horses ran into the corral when the cowboy was driving them?

3. When did the cowboy first notice the horse he wanted to catch?

4. What did the cowboy do which the film said normally wouldn't be done? Why wouldn't it normally be done?

5. What did the film show was the purpose of the post located in the center of the corral?

6. The film music was played on what instrument?

7. In what respect did the film say the Canadian ranches differ from American ranches?

BE SURE YOU HAVE ANSWERED EVERY QUESTION ON THIS PAGE.

Turn the page.

8. What was the title of the film?

9. What two things did the film point out the cowboy did which helped him lead the horse from the corral? (Remember, we want two things.)

10. What was the name of the organization which made the film?

BE SURE YOU HAVE ANSWERED EVERY QUESTION ON THIS PAGE.

Turn the page.

ATTITUDES AND EVALUATIONS

The following questions are concerned with your attitudes and evaluations of the film. We want to know what you thought about it. Please answer each question, giving only one answer. If in doubt about an answer, mark the one you feel most represents what you feel. Please follow the instructions for each type of question. If you have any questions about what is asked, raise your hand.

Place the letter standing for the best answer in the blank provided.

1. How involved were you in the film (i.e., how much did it hold your attention?)__________________________

   A. Extremely involved
   B. Very involved
   C. Slightly involved
   D. Not involved
   E. Very bored

2. How would you rate the incident as a subject of a film?__________

   A. Extremely good subject
   B. Very good subject
   C. Slightly good subject
   D. Neither especially good or poor as a subject
   E. Poor subject

3. How exciting was the film?__________

   A. Extremely exciting
   B. Very exciting
   C. Slightly exciting
   D. Not exciting
   E. Dull

BE SURE YOU HAVE ANSWERED EVERY QUESTION ON THIS PAGE.

Turn the page.

4. How much do you feel you learned from the film?_______

   A. Extremely much
   B. Very much
   C. Some
   D. Not very much
   E. Nothing at all

5. When not performing for the camera, the cowboy probably__________

   A. Handles the horses like he did in the film
   B. Is rougher with the horses, but does not mistreat them
   C. Mistreats the horses

6. How much do you feel the cowboy enjoys his work in real life?__________

   A. He enjoys it extremely much
   B. He enjoys it very much
   C. He enjoys it slightly
   D. It is just another job to him
   E. He doesn't like it

7. Which of the following statements do you think might best describe the cowboy of the film?________________

   A. He is a lover of animals, especially horses
   B. He holds no special affection for horses, but regards them as work animals
   C. He doesn't like horses

8. How much intelligence does it take to be a cowboy?____

   A. A great deal
   B. A moderate amount
   C. About average
   D. Less than average
   E. Not very much

BE SURE YOU HAVE ANSWERED EVERY QUESTION ON THIS PAGE.

Turn the page.

9. How much skill does it take to be a cowboy?__________

   A. A great deal
   B. A moderate amount
   C. About average
   D. Less than average
   E. Not very much

10. How exciting is the real life of the cowboy we saw?__________

   A. Extremely exciting
   B. Very exciting
   C. Slightly exciting
   D. Not especially exciting
   E. Dull

11. How would you characterize the attitude of the horse in the film?__________

   A. He was frightened of being saddled
   B. He was nervous about being saddled, but not especially frightened
   C. He was angry about being saddled
   D. He didn't mind being saddled, but he treated it as a game

12. At what grade level do you feel this film will have most appeal?__________

   A. Grade school
   B. Junior High School
   C. Senior High School
   D. College

13. Which sex do you feel would probably appreciate this film more?__________

   A. Boys
   B. Girls
   C. The film appeals equally to both boys and girls

BE SURE YOU HAVE ANSWERED EVERY QUESTION ON THIS PAGE.
Turn the page.

Please rate the following statements on the following scale

A. Excellent
B. Good
C. Fair
D. Poor
E. Terrible

EXAMPLE: The weather in California._____A_____

1. The film as a whole.__________
2. The film music.__________
3. The film photography.__________
4. The cowboy as an actor.__________
5. The cowboy as a story character.__________
6. The editing of the film.__________
7. The shots of action in the film.__________
8. The shots of scenery in the film.__________
9. The film narration.__________

Please give a short answer response to the following questions, as indicated.

1. How would you state the theme of the film?

2. What do you consider the most exciting part of the film?

BE SURE YOU HAVE ANSWERED EVERY QUESTION ON THIS PAGE.

Turn the page.

3. Was there conflict in the film, and if so, what do you think it was?

4. What do you think was the purpose of the film?

5. Have you ever seen this film before? (Yes, No)________

   If Yes, how many times?

6. Who or what do you think was the "hero" of the film?

Please write any additional comments or evaluations you have about the film. Include any suggestions you have on how the film might be improved. If you have none, then write "None."

YOU ARE NOW FINISHED. TURN YOUR PAPER OVER AND WAIT FOR FURTHER INSTRUCTIONS.

APPENDIX V

FORTRAN COMPUTER PROGRAM

APPENDIX V

FORTRAN COMPUTER PROGRAM

This is the FORTRAN program written for the Control Data 1604 computer to accomplish some of the preliminary analysis. In this typed copy, spacing does not necessarily correspond exactly to that used in the program; all usual FORTRAN spacing rules would apply. Some of the time-sampled GSR base level results were not outputted from the program and had to be filled-in by hand. It is hoped this was not the fault of the program. Spacings allowed on print and punch statements were designed to permit these to correspond to the spacings of hand-punched data, e.g., numbers in the Hollerith (H) fields.

```
      PROGRAM MILL
C     MEAN OF GSR AMP, RES
C     MEAN AND SD OF GSR BASE LEVEL, RES, COND, LOGC
C     SUM OF TIME SAMPLED SPOTS OF GSR BASE LEVEL
C     SUMG, SUMH, SUMI, SUMJ, SUMK, SUML, SUMM, SUMN,
C     SUMX, SUMY, ARE TIME SAMPLED SPOTS OF GSR BASE
C     LEVEL.  THEY ARE ALTERNATELY FIRST AND SECOND
C     HALVES FOR MM, FF, MF, FM.  FINALLY, SUMX AND SUMY
C     ARE FIRST AND SECOND HALF TOTALS OVER ALL GROUPS.
C     ID=IDENTIFICATION NUMBER
```

```
C     A1,A2 ARE BASE LEVEL VECTOR SCORES FOR EACH HALF.
C     AM1, CM1, CLM1, AM2, CM2, CLM2 ARE BASE LEVEL MEANS
C     IN RES, COND, LOGC FOR BOTH HALVES.
C     ASD1, CSD1, CLSD1, ETC ARE STANDARD DEVIATIONS,
C     AS ABOVE.
C     ABAR1, ABAR2 ARE AMP MEANS, RESISTANCE ONLY.
C     D1, D2, DT ARE MSSD SCORES FOR EACH HALF, AND TOTAL,
C     RES.
C     C1, C2, CL1, CL2, CT, CLT ARE COND AND LOGC MSSD,
C     AS ABOVE.
C     V=NUMBER GSRS IN FIRST HALF, W=NUMBER GSRS IN
C     SECOND HALF.
C     TMAX=MAXIMUM BASE LEVEL.
C     AMP1, AMP2 ARE AMPLITUDE VECTOR SCORES, FOR EACH HALF.
C     DATA IS READ IN CARD BY CARD.

      DIMENSION A1(11), A2(11), AMP1(73), AMP2(73),SUMX(11),
     CSUMY(11), SUMG(11), SUMH(11), SUMI(11), SUMJ(11),
     CSUMK(11), SUMM(11), SUMN(11)
      DO 20 L=1,11
      SUMX(L)=SUMY(L)=SUMI(L)=SUMK(L)=0.0
      SUML(L)=SUMM(L)=SUMN(L)=0.0
20    CONTINUE
      DO 8 I=1,80
      READ 9, ID, A1 V
      READ 10, A2, W
      M=V
      N=W
      READ 11, (AMP1(J), J=1,M)
      READ 11, (AMP2(J), J=1,N)
9     FORMAT (I2, 5X, 12F4.0)
10    FORMAT (7X, 12F4.0)
11    FORMAT (7X, 18F4.0)
      IF (I.LE.20) 71, 73
71    DO 80 L=1,11
      SUMG(L)=SUMG(L)+A1(L)
      SUMH(L)=SUMH(L)+A2(L)
80    CONTINUE
      GO TO 83
73    IF (I.LE.40) 74, 75
74    DO 81 L=1,11
      SUMI(L)=SUMI(L)+A1(L)
      SUMJ(L)=SUMJ(L)+A2(L)
```

```
81    CONTINUE
      GO TO 83
75    IF (I.LE.60) 76,77
76    DO 82 L=1,11
      SUMK(L)=SUMK(L)+A1(L)
      SUML(L)=SUML(L)+A2(L)
82    CONTINUE
      GO TO 83
77    DO 83 L=1,11
      SUMM(L)=SUMM(L)+A1(L)
      SUMN(L)=SUMN(L)+A2(L)
83    CONTINUE
      DO 3 L=1,11
      SUMX(L)=SUMX(L)+A1(L)
      SUMY(L)=SUMY(L)+A2(L)
3     CONTINUE
      CALL BASEL (A1, AM1, CM1, CLM1, ASD1, CSD1, CLSD1)
      CALL BASEL (A2, AM2, CM2, CLM2, ASD2, CSD2, CLSD2)
      CALL MSSD (A1,A2,D1,D2,DT,C1,C2,CL1,CL2,CT,CLT)
      CALL CLAMP (AMP1, M, ABAR1)
      CALL CLAMP (AMP2, N, ABAR2)
      PRINT 119, ID, AM1, CM1, CLM1, ASD1, CSD1, CLSD1, D1
      PRINT 120, ID, AM2, CM2, CLM2, ASD2, CSD2,CLSD2,D2,DT
      PRINT 121  ID, ABAR1,ABARC1,ABARL1,ABAR2,ABARC2,ABARL2
      PRINT 122, ID, C1,C2,CL1,CL2,CT,CLT
      PUNCH 222, ID,AM1,CM1,CLM1,ASD1,CSD1,CLSD1,D1
      PUNCH 112, ID, AM2,CM2,CLM2,ASD2,CSD2,CLSD2,D2,DT
      PUNCH 113, ID,ABAR1,ABARC1,ABARL1,ABAR2,ABARC2,ABARL2
      PUNCH 116, ID,C1,C2,CL1,CL2,CT,CLT
119   FORMAT (1X, I2, 4H  5 , 7F9.4)
120   FORMAT (1X, I2, 4H  6 , 8F9.4)
121   FORMAT (1X, I2, 4H  7 , 6F9.4)
122   FORMAT (1X, I2, 4H 24 , 6F9.4)
222   FORMAT (I2, 5H  5   , 7F9.4)
112   FORMAT (I2, 5H  6   , 8F9.4)
113   FORMAT (I2, 5H  7   , 6F9.4)
116   FORMAT (I2, 5H 24   , 6F9.4)
8     CONTINUE
      PRINT 115, SUMG, SUMH, SUMI, SUMJ, SUMK, SUML,
     CSUMM, SUMN, SUMX, SUMY
115   FORMAT (1X, 11F10.0)
      END
      SUBROUTINE BASEL (A, AMEAN, PMEAN, QMEAN, ASD,
     CPSD, QSD)
C     MEAN, SD OF GSR BASE LEVEL, RES,COND,LOGC
      DIMENSION A(11), P(11), Q(11)
      ASUM=AASUM=PSUM=PPSUM=QSUM=QQSUM=0.0
      DO 17 J=1,11
      ASUM=ASUM+A(J)
      AASUM=AASUM+(A(J)*A(J))
      P(J)=1000./A(J)
      PSUM=PSUM+P(J)
      PPSUM=PPSUM+(P(J)*P(J))
      Q(J)=LOGF(P(J))
      QSUM+QSUM+Q(J)
      QQSUM=QQSUM+(Q(J)*Q(J))
17    CONTINUE
      AMEAN=ASUM/11.
      PMEAN=PSUM/11.
      QMEAN=QSUM/11.
      AVAR=(AASUM-((ASUM*ASUM)/11.))/10.
      ASD=SQRTF(AVAR)
      PVAR=(PPSUM-((PSUM*PSUM)/11.))/10.
      PSD=SQRTF(PVAR)
      QVAR=(QQSUM-((QSUM*QSUM)/11.))/10.
      QSD=SQRTF(QVAR)
      RETURN
      END


      SUBROUTINE MSSD (A,B,AMSSD,BMSSD,TMSSD,CMSSD,
     CDMSSD,GMSSD,HMSSD,QMSSD,RMSSD)
C     MSSD OF GSR BASE LEVEL
      DIMENSION A(11), B(11), C(11), D(11), G(11), H(11)
      AMSUM=BMSUM=CMSUM=DMSUM=GMSUM=HMSUM=0.0
      DO 12 J=1,10
      AMSUM=AMSUM+((A(J)-A(J+1))*(A(J)-A(J+1)))
      BMSUM=BMSUM+((B(J)-B(J+1))*(B(J)-B(J+1)))
      C(J)=1000./A(J)
      D(J)=1000./B(J)
      K=J+1
      C(K)=1000./A(J+1)
      D(K)=1000./B(J+1)
      CMSUM=CMSUM+((C(J)-C(K))*(C(J)-C(K)))
      DMSUM=DMSUM+((D(J)-D(K))*(D(J)-D(K)))
      G(J)=LOGF(C(J))
      H(J)=LOGF(D(J))
      G(K)=LOGF(C(K))
      H(K)=LOGF(D(K))
      GMSUM=GMSUM+((G(J)-G(K))*(G(J)-G(K)))
      HMSUM=HMSUM+((H(J)-H(K))*(H(J)-H(K)))
12    CONTINUE
      TMSUM=AMSUM+BMSUM+((A(11)-B(1))*(A(11)-B(1)))
      QMSUM=GMSUM+DMSUM+((C(11)-D(1))*(C(11)-D(1)))
      RMSUM=GMSUM+HMSUM+((G(11)-H(1))*(G(11)-H(1)))
      AMSSD=AMSUM/10.
      BMSSD=BMSUM/10.
      CMSSD=CMSUM/10.
      DMSSD=DMSUM/10.
      GMSSD=GMSUM/10.
      HMSSD=HMSUM/10.
      TMSSD=TMSUM/21.
      QMSSD=QMSUM/21.
      RMSSD=RMSUM/21.
      RETURN
      END

      SUBROUTINE CLAMP (A,K,BARA)
C     MEAN OF GSR AMPLITUDE, RES
      DIMENSION A(73)
      ASUM=0.0
      DO 15 J=1,K
      ASUM=ASUM+A(J)
15    CONTINUE
      X=K
      BARA=ASUM/X
      RETURN
      END
```

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